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QUEENSLAND AGRICULTURAL JOURNAL

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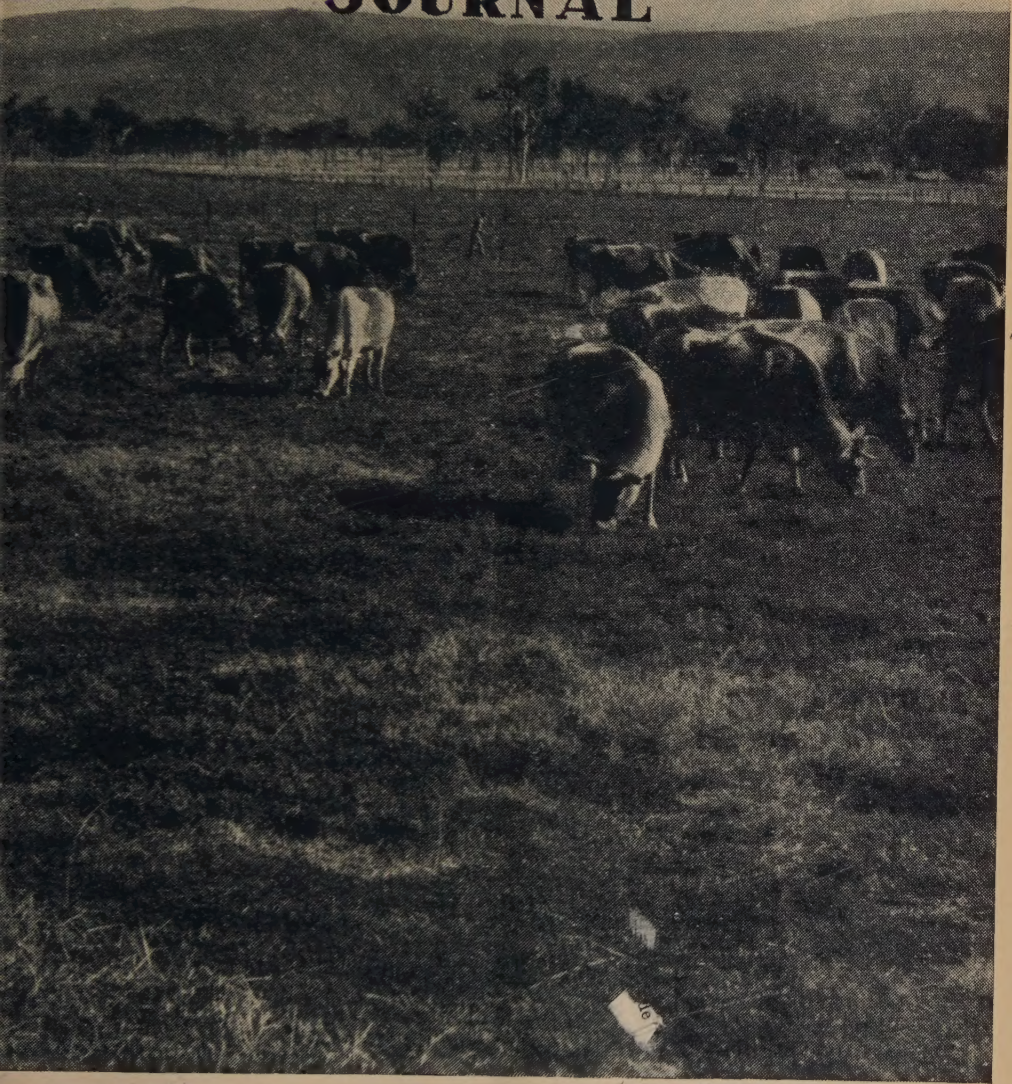

Dairy Cows on Irrigated Pasture.

LEADING FEATURES

Queensland Agriculture in 1953-54
Grass Hay Conservation
Plant Poisoning
Dairy Production in Summer
Castrating Pigs
Blady Grass Control
The Athel Tree
Pleuropneumonia of Cattle
Fluorosis of Sheep

Registered at the General Post Office, Brisbane, for transmission by Post as a Newspaper.

EXTENSION SERVICES IN SOUTH QUEENSLAND.

★

Allora:	Dairying.
Beaudesert:	Agriculture, Dairying, Pig Raising, Stock Inspection.
Beenleigh:	Dairying, Horticulture.
Biggenden:	Dairying.
Boonah:	Agriculture, Dairying, Stock Inspection.
Boondooma:	Stock Inspection.
Brisbane:	All Services.
Bundaberg:	Agriculture, Dairying, Horticulture, Poultry Raising, Stock Inspection.
Caboolture:	Dairying, Horticulture, Poultry.
Cadarga:	Stock Inspection.
Charleville:	Sheep and Wool, Stock Inspection, Veterinary Services.
Chinchilla:	Dairying, Stock Inspection.
Clifton:	Agriculture.
Coolangatta:	Horticulture, Stock Inspection.
Cooroy:	Dairying, Horticulture.
Crow's Nest:	Dairying, Stock Inspection.
Cunnamulla:	Sheep and Wool, Stock Inspection, Veterinary Services.
Dalby:	Agriculture, Dairying, Sheep and Wool, Stock Inspection.
Esk:	Agriculture, Dairying.
Gatton:	Agriculture, Dairying.
Gayndah:	Agriculture, Cattle Husbandry, Horticulture, Stock Inspection.
Goombungee:	Dairying.
Goondiwindi:	Agriculture, Stock Inspection.
Gympie:	Agriculture, Cattle Husbandry, Dairying, Horticulture, Stock Inspection.
Helidon:	Stock Inspection.
Inglewood:	Agriculture.
Injune:	Stock Inspection.
Ipswich:	Dairying, Poultry Raising, Stock Inspection.
Jandowae:	Dairying, Stock Inspection.
Killarney:	Dairying, Stock Inspection.
Kingaroy:	Agriculture, Dairying, Stock Inspection, Veterinary Services.
Laidley:	Dairying.
Maryborough:	Dairying, Horticulture, Stock Inspection, Veterinary Services.
Miles:	Cattle Husbandry, Stock Inspection.
Millmerran:	Stock Inspection.
Monto:	Dairying, Stock Inspection.
Mundubbera:	Dairying, Stock Inspection.
Murgon:	Agriculture, Dairying, Pig Raising, Stock Inspection.
Nambour:	Dairying, Horticulture, Plant Disease and Pest Control, Stock Inspection.
Nanango:	Dairying, Stock Inspection.
Oakey:	Dairying, Stock Inspection.
Ormiston:	Horticulture.
Palmwoods:	Horticulture.
Pittsworth:	Agriculture, Cattle Husbandry, Dairying, Stock Inspection.
Proston:	Dairying.
Quilpie:	Stock Inspection.
Roma:	Sheep and Wool, Stock Inspection, Veterinary Services.
Southport:	Dairying, Horticulture, Stock Inspection.
Stanthorpe:	Agriculture, Horticulture, Plant Pest Control.
St. George:	Sheep and Wool, Stock Inspection.
Toogoolawah:	Stock Inspection.
Toowoomba:	Agriculture, Dairying, Horticulture, Pig Raising, Plant Disease and Pest Control, Poultry Raising, Stock Inspection, Veterinary Services.
Wallangarra:	Horticulture.
Wandoan:	Agriculture, Stock Inspection.
Warwick:	Agriculture, Cattle Husbandry, Dairying, Pig Raising, Sheep and Wool, Stock Inspection.
Wondai:	Stock Inspection.
Yarraman:	Stock Inspection.

(Lists of extension services in Central and North Queensland will appear in the next issue.)

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Tuberculosis-Free Cattle Herds.

TESTED HERDS (As at 30th November, 1954).

The Tuberculosis-Free Herd Scheme (which is distinct from the tuberculosis eradication scheme operating in commercial dairy herds) was initiated by the Department of Agriculture and Stock for the purpose of assisting owners of cattle studs to maintain their herds free from tuberculosis and so create a reservoir of tuberculosis-free cattle from which intending purchasers can draw their requirements.

The studs listed here have fulfilled the conditions to the date shown above.

Full particulars of the scheme and Agreement for Testing forms may be obtained from the Under Secretary, Department of Agriculture and Stock, Brisbane, or from Divisional Veterinary Officers throughout the State.

Breed.	Owner's Name and Address.
Aberdeen Angus	The Scottish Australian Company Ltd., Texas Station, Texas F. H. Hutton, "Bingegang," Dingo
A.I.S.	M. E. & E. Scott, "Wattlebrae" A.I.S. Stud, Kingaroy F. B. Sullivan, "Fermanagh," Pittsworth D. Sullivan, "Bantry" Stud, Rossvale, *via* Pittsworth W. Henschell, "Yarranvale," Yarranlea Con. O'Sullivan, "Navillus" Stud, Greenmount H. V. Littleton, "Wongalea" Stud, Hillview, Crow's Nest J. Phillips and Sons, "Sunny View," Benair, *via* Kingaroy Sullivan Bros. "Valera" Stud, Pittsworth Reushle Bros., "Reubydale" Stud, Ravensbourne H. F. Marquardt, "Chelmer" Stud, Wondai A. C. and C. R. Marquardt, "Cedar Valley," Wondai A. H. Sokoll, "Sunny Crest" Stud, Wondai W. and A. G. Scott, "Welena" A.I.S. Stud, Blackbutt G. Sperling, "Kooravale" Stud, Kooralgin, *via* Cooyar C. J. Schloss, "Shady Glen," Rocky Creek, Yarraman W. H. Thompson, "Alfa Vale," Nanango S. R. Moore, Sunnyside, West Wooroolin H.M. State Farm, Numinbah D. G. Neale, "Groveley," Greenmount Edwards Bros., "Spring Valley" A.I.S. Stud, Kingaroy A. W. Wieland, "Milhaven" A.I.S. Stud, Milford, *via* Boonah W. D. Davis, "Wamba" Stud, Chinchilla Queensland Agricultural High School and College, Lawes C. K. Roche, Freestone, Warwick Mrs. K. Henry, Greenmount D. R. Green, Deloraine Stud, Durong, Proston E. Evans, Wootha, Maleny
Ayrshire	L. Holmes, "Benbecula," Yarranlea J. N. Scott, "Auchen Eden," Camp Mountain "St. Christopher's" and "Iona" Studs, Brookfield road, Brisbane E. Mathie and Son, "Ainslie" Ayrshire Stud, Maleny C. E. R. Dudgeon, "Marionville" Ayrshire Stud, Landsborough G. F. H. Zerner, "Pineville," Pie Creek, Box 5, P.O., Gympie T. F. Dunn, Alanbank, Gleneagle
Friesian	C. H. Naumann, "Yarrabine" Stud, Yarraman
Guernsey	C. D. Holmes, "Springview," Yarraman A. B. Fletcher, Cossart Vale, Boonah W. H. Doss, Degilbo, *via* Biggenden
Jersey	Queensland Agricultural High School and College, Lawes J. S. McCarthy, "Glen Erin" Jersey Stud, Greenmount J. F. Lau, "Rosallen" Jersey Stud, Goombungee G. Harley, Hopewell, M.S. 189, Kingaroy Toowoomba Mental Hospital, Willowburn Farm Home for Boys, Westbrook F. J. Cox and Sons, "Rosel" Stud, Crawford, Kingaroy Line R. J. Browne, Hill 60, Yangan P. J. L. Bygrave, "The Craigan Farm," Aspley R. J. Crawford, "Inverlaw" Jersey Stud, Inverlaw, Kingaroy P. H. F. Gregory, "Carlton," Rosevale, *via* Rosewood E. A. Matthews, "Yarradale," Yarraman A. L. Semgreen, "Tecoma," Coolabunia L. E. Meier, "Ardath" Stud, Boonah A. M. and L. J. Noone, "Winbirra" Stud, Mt. Esk Pocket, Esk W. S. Conochie and Sons, "Brookland" Stud, Sherwood road, Sherwood Estate of J. A. Scott, "Kiaora," Manumbar road, Nanango F. W. Verrall, "Coleburn," Walloon C. Beckingham, Trouts road, Everton Park W. E. O. Meier and Son, "Kingsford" Stud, Alberton, *via* Yatala G. H. Ralph, "Ryecombe," Ravensbourne Mrs. I. L. M. Borchert, "Willowbank" Jersey Stud, Kingaroy W. and C. E. Tudor, "Boree" Jersey Stud, M.S. 498, Gayndah Weldon Bros., "Gleneden" Jersey Stud, Upper Yarraman D. R. Hutton, "Bellgarth," Cunningham, *via* Warwick J. W. Carpenter, Flagstone Creek, Helidon H. G. Johnson, "Windsor" Jersey Stud, Beaudesert W. S. Kirby, Tinana, Maryborough
Polled Hereford	W. Maller, "Boreview," Pickanjinnie J. H. Anderson, "Inverary," Yandilla D. R. and M. E. Hutton, "Bellgarth," Cunningham, *via* Warwick E. W. G. McCamley, Eulogie Park, Dululu Wilson and McDouall, Calliope Station, Calliope

Queensland Agriculture in 1953-54.

In the Annual Report of the Department of Agriculture and Stock, presented to Parliament in November, the Under Secretary of the Department (Mr. Arthur F. Bell) dealt with various industries and the Department's operations in the following terms.

MARKETS.

The "war" era in overseas marketing has now drawn to a close. The principal buyer, the United Kingdom, has now terminated rationing and virtually all commodity purchase controls. Trade has returned to "normal" channels and this in itself has brought some difficulties: The younger generation of business men had in fact come to look on controlled marketing as normal and it has become necessary for them to learn, and the older men to re-learn, the techniques of free marketing.

In spite of many forecasts to the contrary the relaxing of rationing and controls in Britain has not resulted in price rises—but rather the reverse. This is due in great part to the action of the United Kingdom Government in stock-piling very considerable reserves which could be released to counter the effect of any tendency towards buying sprees. The price of eggs has fallen seriously, while prices for butter and cheese are falling in the face of increasing competition from quality produce.

Floor prices for meat are protected in the current 15-year agreement but sales on the trader-to-trader basis became fully operative as from October 1st, 1954. Although a rise in price is again widely forecast it must be conceded that experience with other commodities does not support this view. Queensland sugar production is affected by world prices to the extent that about 25 per cent. of the production is sold at world market prices plus Canadian or U.K. preference; recent free market prices have been below the 3.25 cents minimum sought under the International Sugar Agreement and the International Sugar Council is now examining remedial measures.

Wheat prices have fallen somewhat but the chief difficulty has been the slow movement of wheat following good crops in both hemispheres, coupled with the withdrawal of the United Kingdom from the International Wheat Agreement. However, latest reports indicate some fall in estimates of overseas crops. Decreased demand and price falls have also been experienced in the coarse feed grains, edible oils, and processed milks. Pineapples, which have been an important dollar earner in the post-war years, are meeting acute competition on the Canadian market and increasing competition elsewhere.

The unfortunate effect of these market trends has been that Australia is gradually becoming more and more dependant upon wool and (to a less extent) meat for the maintenance of its overseas credits. It is obvious that every effort must be made to open up new markets for these and other commodities, to present our goods in the most attractive and saleable form, and to cut costs to the minimum. In this connection it is of interest to note that the Queensland Council of Agriculture and its constituent Commodity Boards, assisted by the Commonwealth Bank, have provided the funds to send the Director of Marketing on an overseas study tour.

Although difficult, the position is not such as to justify a lapse into pessimism. The current situation is due in part to troubles associated with the change in the United Kingdom marketing structure, and two years of above-average world production. But it should be remembered that in spite of temporary setbacks the world requirement for primary produce is continuously increasing.

The latest statistics issued by the United Nations Food and Agriculture Organisation show that world population is increasing by the almost unbelievable total of 85,000 every day. In these circumstances there must be a continuously increasing requirement of food and clothing.

SOME ACHIEVEMENTS IN THE MAJOR INDUSTRIES.

The circumstances recorded in the foregoing section make it plain that a serious national effort is required to increase the efficiency of production. No one can seriously question this, but in making pleas for better performance there is perhaps a danger of forgetting what has already been achieved in Queensland primary industries. It is in fact only by taking encouragement from past performances that the problems ahead will be tackled with the confidence and energy they require.

In its major industry Queensland produces the highest quality wool in the Commonwealth and, hence, in the world. The yield of wool per sheep is being continually increased and is now one pound better than in the twenties. On present prices and sheep numbers an increase of one pound weight per fleece would earn nearly £10,000,000 more per year.

The Queensland sugar industry is second only to Hawaii in the production of sugar per acre per month and undoubtedly leads in the production per man. The quantity of sugar produced per acre is now over 40 per cent. greater than it was 25 years ago.

The quantity of beef produced per head of cattle depastured has increased by the remarkable figure of 60 per cent. in the past 30 years.

The average yield of wheat in Queensland over the past ten years has been 28 per cent. above the Australian average while quality is well above all other States. It is produced largely from wheat varieties bred in Queensland.

A recent careful survey conducted by the Division of Marketing indicated that the Queensland average annual egg production per hen was 168, compared with an Australian average of 144 (determined by the Bureau of Agricultural Economics) and the United States published average of 178.

The yield of tobacco is above the Australian average in quantity and quality. Tobacco yields per acre in North Queensland have increased by 80 per cent. in the last 15 years.

THE PROBLEM OF COSTS.

The ultimate objective of research and extension work in primary industry is increased production and high quality. At the same time, of course, scientific institutions such as Departments of Agriculture must concern themselves closely with efficiency in production and its relation to costs. Although we live in an under-fed and ill-clothed world many potential customers have a very limited purchasing power and their ability to consume is determined by their ability to pay.

It is becoming increasingly urgent for Australia to reduce costs in primary production to the fullest extent possible. Costs obviously fall into two categories—those which are determined by national standards and so lie beyond the control of the primary producer, and those on-the-farm costs which are within his control. It is, of course, the latter with which the Department is directly concerned; these costs may be reduced by means such as the use of plants or animals with greater inherent yielding capacity; better husbandry; the reduction of waste caused by diseases and parasites; the elimination of unnecessary operations; greater attention to quality; and efficient use of by-products.

Lower-cost procedures which have been initiated or further developed by Departmental action during the year are illustrated by the following:—

In the dairy industry the survey based on five years of group herd recording was completed and has given some very important leads. A total of 55 herd-recording groups have

been established and 40,000 cows in more than 1,000 herds are under continuous test, thus giving a highly reliable picture of conditions in this industry. The survey has shown that cows calved in the months of July-September (31 per cent.) yielded nearly 25 per cent. more butter than cows calved in January-March (19 per cent.) and about 10 per cent. more than those calved in the remainder of the year. It is not unreasonable to expect that 80 per cent. of the cows could be calved in July-September instead of the present 31 per cent.; if this were effected it alone would annually contribute another 4,300 tons of butter, worth nearly £2,000,000.

With assistance from the Commonwealth Dairy Extension Grant, demonstrations of improved methods are now being carried out on many farms. The "demonstration farms" which were operated as such during the first five years of the grant showed an average increase in their own production of 33 per cent. for 1952/53 compared with 1948/49, whereas the State increase was only 4 per cent. The methods demonstrated are applicable to most dairy areas of the State and if the State as a whole had made a similar percentage increase this would have resulted in another 30 million pounds of butter worth about £6 millions.

In the Horticulture Branch it has been found that spraying summer pineapples with a dilute solution of ANA (alpha-napthalene-acetic acid) about eight weeks before harvesting increased the weight of fruit by more than 20 per cent. Thinning of plums by hand is a laborious operation; promising results have been obtained in thinning by spraying with a new chemical. Wastage in citrus was very much reduced by wrapping the fruit in paper impregnated with diphenyl instead of in plain paper. Soft vegetables such as lettuce, cauliflower, and cabbage have been kept for several weeks in freshly-packed condition by placing in cold storage in plastic bags; the plastic not only prevents dehydration but holds a carbon dioxide concentration from respiration which is sufficient to kill moulds. Waxing of bananas in the bunch greatly reduces blemishes and rotting and this treatment is rapidly passing from the laboratory to trade practice. During the year 122,500 pedigreed citrus buds were distributed to nurserymen for the propagation of better yielding citrus trees.

The Entomology Branch, concentrating on tobacco problems, has developed techniques for the new insecticides dieldrin and aldrin. These have now displaced the standard lead arsenate spray in Queensland with the result that poisonous spray residues have ceased to be a problem. In 1952 18.6 per cent. of the tobacco crop was prohibited from sale because of the residue of arsenic left after spraying to control insect pests.

Hybrid maize seed production has reached the stage when all demands can be met, with some carry-over for emergency. The use of suitable hybrid maize varieties results in an increased yield per acre of about 25 per cent. over the open-pollinated varieties.

Several new varieties of crop plants bred by the Department's plant breeders were released during the year.

In its first full year of operation the fleece-testing laboratory has demonstrated its usefulness to sheep breeders, enabling them to measure rather than to guess various wool characters. It is computed that this service can double the rate of sheep improvement by breeding.

There remains a very wide scope for action by organised primary industry to develop and expand the sale of by-products rather than to rely for so much of the income on the sale of the major product. In this connection it is proposed that the Director of Marketing should visit the countries of Western Europe where primary industry co-operatives have combined to diversify sales. After all, it is the producers who are directly interested

in this form of trade and its development should not be left to the chance interest of commerce.

Research has shown that skim-milk powder and buttermilk powder improve taste, texture, and keeping quality of bread, while milk and cheese are sold in much more varied form in Europe and America than in Australia. The dairy industry as a whole should explore co-operative action in both the development of these products and the marketing of them. Similarly there is scope in the sugar industry for the development of more, and more lucrative, avenues of sale of wax, bagasse, molasses, and their products; molasses is an excellent energy stock food, alone or in combination with roughage, its value at present grain prices being several times its value as raw material for distilleries.

DRY FARMING.

An important and interesting example of adaptation of practice to environment is furnished by last season's wheat crop. On the Darling Downs, where 90 per cent. of the State's wheat crop is produced, planting normally takes place in late May or early June. In the 1953 season no effective rain fell between the first week in May and the last week in August. Nearly half the crop was planted on the May rains but the onset of the dry weather curtailed acreage and postponed planting of the remainder until early September. Nevertheless it is estimated that a crop of 9,750,000 bushels was harvested in November-December at an average yield of 19 bushels per acre.

Over the past decade a great deal of research has been carried out on the water requirements of Queensland crops, and particularly those of grain sorghum and wheat. It has been shown, for example, that on the Biloela Regional Experiment Station a grain sorghum crop must absorb through its roots the equivalent of 10½ acre-inches (or 230,000 gallons) of water to produce a 40 bushel per acre crop. Since during the period of growth no more than 6 inches absorption of rain by the soil can be expected, it is necessary to have at least 4½ inches of water stored in the soil and subsoil before a good crop can be assured. For every inch of stored water over 4½ inches an increase in crop of six bushels per acre can be expected.

Similarly it has been found that six acre-inches of water are necessary to produce a wheat crop of 30 bushels. Thus if six inches of available water can be stored in the top three feet of soil a 25-30 bushel crop can be produced if sufficient rain falls in May or early June to wet the top couple of inches for planting. In other words only relatively light planting rain is necessary to produce a fair to good crop if the crop's moisture requirements are already stored in the ground.

On the basis of these facts the extension services during the post-war period have emphasised the necessity for conserving as much moisture as possible by getting it absorbed into the subsoil of the wheat fields during the preceding summer rains. Farming practices on the Downs have undergone considerable modification in this past decade with a view to eliminating run-off and getting the monsoonal rain down into the soil.

In the result, the area planted in May, 1953 (about 45 per cent.) produced a yield of over 22 bushels per acre. In assessing the importance of this performance it must be remembered that for fourteen weeks of the growing period this crop received no effective rain; moreover this yield compares very favourably with the previous 10-year State and Commonwealth averages of 19.7 and 14.2 bushels per acre respectively. Ten years ago the thought of such a yield under these circumstances would have appeared almost fantastic. It has been achieved by a better understanding of

the water requirements of the crop—and the modification of farming practices accordingly—and by the breeding of varieties more suitable to hard conditions. The slow-maturing varieties Lawrence and Celebration were particularly well suited to the early May plant.

The September-planted crops yielded at the rate of about 16 bushels per acre but it must be remembered that these crops had only a three months growing season and under these conditions the yield was extraordinarily good. It was possible only through the availability of fast-maturing, rust-resistant varieties; of these Spica and Festival proved very useful.

Another dry-farming development is seen in the increasing interest in the growth of lucerne as a row crop. In areas of lower rainfall lucerne requires too much water for successful growth as a sward and the thinned sward is heavily invaded by weeds in the wet season. Yet lucerne is by far our most valuable high-protein legume and these above-mentioned disabilities can be largely overcome by cultivation in rows. About 2,000 acres of lucerne have been planted in rows in the new Wandoan dairying area and will provide high-grade grazing at a time when it is needed most.

DEVELOPMENT AND CONSERVATION OF LAND RESOURCES.

In past years, in this Report, attention has been drawn to the developmental potential of the brigalow country beyond the coastal range and the wallum country of the north coast.

Running northwards from Goondiwindi, through Wandoan to the Dawson, is a tract of grey-black soil of which about 23 million acres is still under brigalow "scrub." Of this area about two-thirds must be classed as good soil and much of it is in the zone with a fair winter rainfall component. This part of Queensland is obviously destined to be used for intensified animal production in association with cropping, particularly cereals. At the same time the clearing of this land for pastures or the plough presents particular difficulties due to the unusual vitality of the brigalow.

Following preliminary experiments in the killing of brigalow with new weedicides the Government Botanist paid a visit to the United States in the latter part of 1952 and there made a first-hand study of the destruction of mesquite by aerial spraying. Since then, with valued co-operation from pastoralists, chemical manufacturers and an aviation company, a series of large-scale aerial spraying experiments has been carried out.

Although the results of these experiments cannot be definitely assessed as yet, it can at least be said that there is a very good prospect of achieving a "kill" of brigalow at a cost of approximately 45s. to 55s. per acre. Graziers have been so impressed that already some 50,000 acres have been aerially sprayed during the past year.

A further experiment on the destruction of eucalypt regrowth in pastoral areas is now being carried out on the cattle research station at Brian Pastures, near Gayndah.

In marked contrast to the fertile brigalow soil is the plantfood-deficient soil of the wallum. This area has not yet been precisely mapped but it can be said that there is at least 2-3 million acres on the coastal plain between Brisbane and Gladstone. The term "wallum" covers a number of soil types but in general they are deficient in lime and phosphate, and the minor elements, copper, zinc, and probably molybdenum. They are also (as are most soils) deficient in nitrogen so that utilisation would involve the growth of legumes or applications of nitrogenous fertilizer.

This is, admittedly, an imposing array of shortcomings. On the other hand, this strip enjoys one of the best rainfalls in Queensland, it is handy to large centres of population, it is well served by rail and road, and

amenities such as electricity are close to hand. If the plant-food deficiencies could be economically overcome it should become the milk, beef-fattening, and perhaps fat lamb supply area for a growing Brisbane.

The existence of lime, phosphate, nitrogen, and copper deficiencies in this general area have long been known and corrected where necessary in the sugar and pineapple fields and the pine tree plantations of the Forestry Department. It is obvious, however, that if full development is to be achieved much of the land must go under pastures.

The problem of establishing and maintaining suitable mixed pastures on wallum country is now being investigated by the C.S.I.R.O. at Beerwah and, along with other crops, by this Department on a different soil at Coolum. The problem is not only one of providing the necessary mineral plantfoods but also the equally important one of ensuring the proper nodulation of the clovers and other legumes; this aspect is being given particular attention.

These experiments are only in their exploratory stages, but there is every indication that the main technical problems will be solved in a very few years.

At least of equal importance to the development of new tracts of country is the maintenance in full productive capacity of the older developed areas. This calls for the continuous application of measures designed to prevent soil erosion and maintain soil fertility. Such conservation measures are based on the principles of sound farming—they are only in minor degree dependent on the perhaps more spectacular building of earth works with massive machines. For this reason the Department did not set up a separate subdepartment of soil conservation, but incorporated soil conservation as part of the general agricultural services; the passing years have justified this attitude.

Contouring, diversion banks, and waterways can for the most part be constructed with unpretentious farm equipment, but technical and surveying advice and assistance are necessary for most farmers. The staff is inadequate to meet promptly all requests for advice and some works are being carried out independently. In only the more advanced stages of erosion is equipment outside the farm range required for remedial measures.

During the period under review a further 10,000 acres was protected mechanically under Departmental supervision whilst specific advice on agronomic (as distinct from mechanical) measures to prevent erosion was given in respect of a much greater area. Private contractors are tending to enter the field and six such contractors are now operating on the Darling Downs, using plans prepared by Departmental officers.

The agronomic measures now being applied to correct the early stages of erosion include rotation to pastures, protection by thicker sown pastures instead of thin native pastures, reducing the number of tillage operations, and leaving crop residues to act as a surface mulch instead of burning them. It is impossible to assess what adoption of these measures is now doing to conserve soil in Queensland, but certainly it is of very great, and growing, importance.

A very desirable and new approach to soil conservation schemes is now developing whereby communities of farmers band together on a watershed basis. Where a group of farmers occupy the watershed of a stream it is obvious that full efficiency cannot be attained by working independently; drainage, water disposal and diversion banks should be common, and co-ordinated not only between farmers but also with appropriate public authorities. During the year plans for group projects each involving several thousand acres have been drawn up for farmers in the Atherton, Booie Road, Wooroolin, Memerambi, and Pittsworth areas.

SUGAR.

The 1953 season witnessed a sudden, though planned, rise in production, and sugar passed the million tons for the first time. The area harvested was 332,703 acres (274,757 in 1952), the tons of cane crushed was 8,751,063 (6,841,536) and the tons of 94 net titre sugar manufactured was 1,220,383 (934,614). New records were created in unit production, the yield of cane being 26.3 tons per acre and of sugar 3.67 tons per acre. Thus 7.19 tons of cane were required to manufacture one ton of sugar compared with 7.32 tons in 1952.

Although the 1952 crop had created a record the 1953 tonnage of sugar exceeded it by 30.5 per cent. The 1954 crop appears certain to create still another record and the present estimate is that 1,308,900 tons of 94 net titre sugar will be manufactured from nearly 9,500,000 tons of cane. The yield of cane per acre is expected to be about 1.5 tons below 1953.

Seasonal sugar prices realised were £47 18s. 6d. for home consumption sugar, £39 18s. for sugar sold to the United Kingdom at a price negotiated under the Commonwealth Sugar Agreement, and £31 3s. per ton for sugar sold on the preferential markets. The overall price was £42 7s. 11d. per ton compared with £42 12s. 3d. realised for 1952 sugar.

Early seasonal prospects for the 1955 season are good.

The Commonwealth Sugar Agreement, concluded in December, 1951, provided Australia with a market for 600,000 tons of sugar, of which 314,000 tons is to be sold to the United Kingdom at a price negotiated annually, whilst the remainder is sold at world parity plus U.K. or Canadian preference. These quotas have since been confirmed under the International Sugar Agreement signed in London last year.

With home consumption about 500,000 tons, it is obvious that the presently estimated 1954 production will exceed visible market requirements by about 200,000 tons. Some relief may be obtained by taking up shortfalls in other British Commonwealth sugar producing countries, but a big carry-over is inevitable. However, it is fully realised by industry leaders that if the market quotas are to be filled every year then a carry-over from good years is essential to eliminate deficits in poor years. Only by such action can the retention of quotas be justified and assured. It is expected that manufacture in the 1955 season will be limited to the aggregate of the mill "peaks" (1,170,900 tons), which approximates the visible market.

In 1951 the sugar industry was faced with the formidable task of increasing production by some 50 per cent.; it is a tribute to the industry's resourcefulness that this has been more than achieved in less than three years. A big programme of mill expansion was undertaken and the Central Sugar Cane Prices Board granted new and additional assignments to raise the cultivated acreage to the necessary levels.

It is true that production achievement has for the present overshot the production goal. In this respect, however, three things should be borne in mind: Firstly, seasonal conditions for the 1954 crop have been well above average. Secondly, the area under cane has been increased by some 35 per cent.; this is "new" land and so has a fertility level much higher than will be the case in four or five years time; yields will therefore be inflated for a time. Thirdly, in a period of rapid expansion the ratio of the higher yielding plant and first ratoon crops to the total crop is greater than normal; this also temporarily inflates yields. Accordingly, therefore, we must expect some settling down within the next three or four years.

The sugar industry is now a "£50 million industry" and has played a notable part in the development of the Australian tropics. It is second only to wheat in earning power of the cultivated crops of Australia.

CEREAL CROPS.

Wheat remains the leading grain crop in this as in other States. Although the winter seasons of 1953 and 1954 have been subnormal, nevertheless a crop of nearly 10 million bushels was harvested last year and a crop of 15 million bushels has been forecast for 1954.

Late in 1953 the Commonwealth and the several State Governments legislated to continue the authority of the Australian Wheat Board for a further three years to enable the Commonwealth to participate in the International Wheat Agreement and also to provide for a guaranteed price for wheat sold in Australia. The I.W.A. provides for ceiling and floor prices of 18s. 3½d. and 13s. 10d. respectively in store at port. However, although these prices are satisfactory, the withdrawal of the United Kingdom, Italy, and Sweden from the Agreement, coupled with good crops and substantial carry-over overseas, has made the market sluggish and a large carry-over of Australian stocks seems certain. The current Agreement covers only 389 million bushels, compared with 581 bushels in the previous Agreement.

The State Governments, after prolonged discussion with the Commonwealth, agreed in July of this year to implement a stabilisation plan for five years, based on a guaranteed domestic price of 14s. per bushel f.o.r. ports, or the ruling I.W.A. price, whichever was the lesser, but provided the price shall not be lower than the ascertained cost of production. Provision is made in the plan for the payment of a premium of 3d. per bushel to Western Australian growers to offset freight advantages and also adjustment of the local price to bear the cost of freight to Tasmania.

Preparation for the bulk handling of wheat by the State Wheat Board is proceeding. Bulk stores are in course of erection at three centres on the Darling Downs, whilst plans for the bulk terminal at Pinkenba are in an advanced stage.

Barley has assumed additional economic importance with a crop of over 2 million bushels in 1952 and 1 million and an estimated 1 million bushels in 1953 and 1954 respectively. Maize production has declined in favour of grain sorghum production on less favoured lands and now appears stabilised around 2½ million bushels. The area planted to grain sorghum fluctuates considerably and is influenced by the previous season's wheat plantings. This crop appears to be established around 2.5-3 million bushels.

The overseas market price trends have markedly affected the export sales prospects for these latter three grains. Between 1952-53 and 1953-54 maize fell from 13s. 9d. to 11s. per bushel, grain sorghum from £25 to £15 per ton, and barley from 17-18s. to 9-10s. per bushel. These lowered prices must be expected to influence trends in the pig and poultry industries and could (with benefit) influence farm practice by favouring some degree of rotation to other crops.

The Queensland cereal industries are fortunate in that they are for the most part based on fertile soils which have not, as yet, required the addition of fertilizer. However, this has led to some exploitation of the land and serious consideration must soon be given by cereal growers to the need for alternating cultivation with rotation to grass and animal production.

During the year there was established a Cereals Advisory Committee consisting of three industry representatives nominated by the Grain Growers' Association and two Departmental representatives. This Committee is now examining plans for investigating crop diversification and soil regenerative practices.

The production of the summer grains—maize and grain sorghum—is far below what might reasonably be assessed as a desirable level for domestic requirements. The beef, dairy, and pig industries, unlike those of other countries, use little grain; should

we follow the American pattern then demand would increase several-fold.

TOBACCO.

The pendulum of tobacco sales has again swung: Following a good clearance at the 1951 sales with an average price of 105.2d., the 1952 sales finished with about a fifth of the crop unsold, while the average price for leaf sold dropped to 84.51d. This naturally depressed plantings and in 1952-53 the harvest dropped to 3,431,300 lb., compared with 4,666,699 lb. in 1951-52, while the average price of the 89.7 per cent. sold moved to an intermediate value of 102.99d. The 1953-54 crop is estimated to yield 4,350,000 lb.; to the end of June, 1954, 2,965,358 lb. had been offered and 2,759,287 lb. (or 94.26 per cent.) sold at an average price of 145.97d. per lb. Sales conducted since June 30th have attracted a somewhat lower figure but it is expected that 90 per cent. or more of the offerings will be sold at an average price of approximately 134d.

It is true that the quality of the leaf offered this year showed a distinct improvement: The season was generally favourable; the control of pests was better and the problem of undesirable spray residues was solved as a result of the development of a new insecticide; field husbandry showed some improvement; farmers' grading and packing were better; and the varietal position was improved.

However, all these factors combined were by no means wholly responsible for the record price levels attained. Bidding at sales was unusually competitive, due no doubt in part to the participation of a new "big" buyer and also to the fact that the Commonwealth Government had announced increases in the statutory percentages of Australian leaf which must be incorporated in tobacco mixtures and cigarettes to attract concessions in import duties. One result of the high prices was the almost complete elimination of the small buyers from purchases. Thus it remains to be seen whether the high prices of the 1954 sales will be either lasting or prove advantageous in the long term.

There has undoubtedly been a feeling of enmity and suspicion between growers and manufacturers which has acted to the detriment of the tobacco industry. During the year a number of conferences have been held between growers, manufacturers, officers of the Commonwealth Department of Commerce and Agriculture, and officers of this Department. Although success has not yet attended efforts to devise a marketing stabilisation scheme, it does appear that general relations have improved. The major manufacturers have opened their factory grading floors to inspection by Government officers and the appraiser of the Tobacco Leaf Marketing Board and have also agreed to participate in the conduct of grading schools in the tobacco growing areas.

A cost of production survey has been carried out by the Commonwealth Bureau of Agricultural Economics and it is expected that this will assist the further projected discussions upon a stabilisation scheme. During the year, also, the Board was given the statutory power necessary to enable it to deal effectively with leaf submitted in badly graded and packed condition.

As a measure of encouragement to the Australian tobacco industry the Commonwealth Government in 1936 introduced a scheme for rebates of import duty on imported tobacco which was mixed with minimum percentages of Australian leaf. This rebate presently amounts to 1s. 6d. per lb. for leaf used in tobacco and 1s. 5d. in cigarettes. In view of the increasing production of tobacco this Department has long urged that these percentages should be increased if a stable industry were to be developed. It is gratifying to record that preceding this year's sales the Commonwealth Government announced that the minimum percentage in mixed tobacco would be increased from 10 per cent. to 12½ per cent. from July 1st, 1954; and from 6 per cent. to 7½ per cent. for cigarettes and from 12½ per cent. to

17½ per cent. for mixed tobacco, as from July 1st, 1955. This pre-announcement is an important feature inasmuch as it allows of the pre-purchase of leaf for maturation.

The manufacturers have submitted to the Commonwealth Government proposals for the contribution of funds from growers and manufacturers to match Commonwealth and State Government expenditure on research and extension services. Discussions on the manner in which these proposals can be implemented are now proceeding with the Australian Agricultural Council.

PASTURES.

Reference has been made in recent Annual Reports to the growing appreciation of the fact that grass is a crop and must be treated as such if satisfactory standards of nutrition are to be maintained in the animal industries. The increasing values of, and pressure for, land are influencing a change from extensive to intensive production and nowhere is this more evident than in the changed attitude towards pastures. Further details will be found in the subjoined reports of the Director of Plant Industry and the Director of Agriculture.

The establishment of an agrostological section in the Department was effected some five years ago. Although great difficulty has been experienced in recruiting and retaining trained staff, nevertheless marked progress has been made. The pasture demonstration trials have attracted wide attention and the requests for advice on pasture establishment have outstripped capacity to deal with them; the Director of Agriculture estimates that his field advisory staff spend more than 50 per cent. of their time on pastures.

Significant also is the decision of the Royal National Association to include an improved pasture competition in the Show catalogue and to provide an attractive prize schedule.

A very striking illustration of the effectiveness of the pasture drive is furnished by a recent survey of seed sales. Records submitted by leading seedsmen indicate that the sale of pasture plant seeds this season was more than three times that of the preceding season.

This expansion is even more remarkable when it is realised that supplies could not cope with the demand. There is as yet no commercial organisation for the collection of seed of buffel grass, molasses grass, phasey bean, and Townsville lucerne, so that supplies are inadequate and spasmodic. There can be little doubt that if circumstances permitted, the establishment of a Departmental seed collection section would be a great help in expanding the area under sown pastures.

The permanent pastures of southern Australia are based on the incorporation of clovers, mainly subterranean clover. The development of suitable legumes for pastures under summer rainfall conditions in subtropical and tropical Queensland presents special problems, but substantial progress is being made, particularly in coastal and sub-coastal areas.

A greatly expanded pasture research section of the Division of Plant Industry of the C.S.I.R.O. is now tackling Queensland pasture problems. In order to co-ordinate the work being done in this field of pasture research and extension there has been set up a Pasture Committee consisting of representatives of the C.S.I.R.O., the University, and this Department. By this means unnecessary overlapping is avoided.

There are currently in progress some 160 Departmental pasture trials and 80 pasture demonstrations extending from near Cape York to the border of New South Wales. The bulk of them are naturally in the dairying areas and in the establishment of these, valued advisory and monetary assistance has been received

from the dairying industry through the Dairy Pasture Improvement Committee.

The search for new and more adaptable pasture species is being pursued to the extent permitted by our resources and 40 species plots have been established; it is of interest to note that nine of these have been established on different soil types on far distant Cape York Peninsula.

Provided they are inoculated with their correct strain of nitrogen-fixing bacteria legumes can obtain their nitrogen supplies from the atmosphere instead of requiring the addition of expensive fertilizers. A pathologist has been detailed to carry out the work of isolating efficient strains for the inoculation of pasture plantings. Fertilizer trials are also being carried out in various parts of the State.

In the beef cattle areas the African buffel grass is showing great promise and is being widely planted; this is a case where expansion is severely restricted by the lack of adequate quantities of seed. Green panic, molasses grass, and the phasey bean are also assuming importance in the beef cattle country.

Associated with pasture work is some growing interest in grass hay conservation. Nowhere, and least of all in Australia, is pasture growth sufficiently regular throughout the year to permit full stocking. If waste is to be avoided grass must be mowed during the period of rapid growth and the hay so obtained used to supplement the grazing during the dry winter-spring period.

Late in 1952 the Department purchased two automatic hay balers to demonstrate bush hay conservation in pastoral areas. During the past season something over 30 pastoralists are known to have conserved grass hay and others have made silage; interest is growing and the economics of conservation should soon be tested, both as a drought insurance reserve and as a maintenance ration. As recorded elsewhere the annual seasonal loss of weight in beef cattle is a serious obstacle to quantity and quality of beef production. For the dairying industry more emphasis is being placed on the conservation of grass silage, a development made more practicable by an implement new to Australia, the buck rake.

Irrigated pastures do not constitute an important proportion of the pasture area of Queensland but their importance is rapidly growing. There is as yet no major gravitational irrigation scheme available for pasture lands, but farmers are making increasing use of individual pumping installations and, in a number of cases, "water harvesting" is being practised. Certainly the Department's irrigation advisory services are being taxed to the utmost.

The warmer climate of Queensland favours more rapid establishment of irrigated pastures and greater carrying capacities than are found in southern Australia. Full grazing within six months of sowing, and a sustained grazing rate of two mature cattle to the acre, appear likely to be normal practice. At the Regional Experiment Station at Ayr 46 head of 2-year-old steers were depastured continuously on 25 acres, and mowing was necessary. Dairymen, especially wholemilk producers, are realising that even five acres of irrigated pasture, in conjunction with dry land grazing, can make a profound difference in milk yields.

THE ANIMAL INDUSTRIES.

Seasonal conditions were generally good for the pastoral industries but the dairying industry, after a dry winter in 1953, again experienced dry autumn and early winter conditions in 1954. The seasonal monsoonal rains commenced in January and caused heavy flooding in February, but thereafter ceased abruptly. This early short season resulted in pastures reaching their peak and declining in nutritive value relatively early in the season and consequently cattle have not passed through the winter in good condition.

The total numbers of cattle, sheep, and pigs each showed increases of approximately 5 per cent. over 1953 figures. Total meat production (a record) showed an increase of 3 per cent., wool sales showed an increase of 42,472 bales, or 8 per cent., and earned some £63½ million; on the other hand butter production declined by 15 per cent., cheese by 28 per cent., and total milk by 13 per cent.

Wool values have been generally well sustained under the open auction system. Domestic and export meat prices have remained at a level generally satisfactory to the producer. The war and post-war bulk purchase of meat by the United Kingdom Government ends on 30th September and sales revert to a trader to trader basis. In terms of the Meat Agreement current to 1967 the United Kingdom has guaranteed a minimum average price (to be negotiated annually), but it remains to be seen what influence will be exerted by trader to trader business. Moreover, it is important to note that the U.K. Government guarantee refers to wholesale prices in London and not to returns to the Australian producer.

The contract between the United Kingdom and Australian Governments for the purchase of Australia's exportable surplus of butter and cheese expires on 30th June, 1955, and the export trade will then presumably return to a fully competitive basis. Meanwhile open market price trends indicate a difficult time ahead. There was no change in the guaranteed local price of butter during the year; the Dairy Industry Investigation Committee found that the cost of production had increased by 1.72d. per lb. but recommended against the granting of an increased price on the grounds that it would build up consumer resistance.

Pigmeat production at 17,748 tons increased by 10 per cent. over 1952-53. The bulk purchase contract expires on 30th September, and export sales prospects thereafter are not particularly good. Egg production increased by 8 per cent. The bulk purchase contracts with the United Kingdom Government terminated on 31st May, 1953 (eggs in shell) and 31st May, 1954 (egg pulp) and serious falls in export values were experienced instead of the anticipated rises. Returns for 16 lb. pack dropped by more than 11d. per dozen, compared with 1952-53, and proved so serious that the Commonwealth Government has deemed it necessary to assist the poultry industry with a special grant of £250,000.

The activities of the Sheep and Wool Branch have been concentrated upon a reorientation of extension service methods and the development of the new fleece measurement laboratory service. The latter aims at the substitution, where practicable, of analysis or measurement for visual assessment in the selection and culling of breeding sheep. This service is rapidly being accepted and sought by studmasters and can be expected to speed up the rate of improvement of the Merino flocks. Some success has also been achieved in initiating fodder conservation experiments and a number of properties conserved up to 10,000 bales of grass hay.

Research work, particularly on problems of infertility of rams and ewes and mortality among lambs, were further studied on the Toorak Field Station with considerable success. These problems are of particular moment in the tropical zone where net reproduction rates are too low for culling and flock replacement.

Australian studmasters have achieved remarkable results in flock improvement down the years and it would appear that this success may have induced a certain amount of complacency. It is suggested that the time has arrived when consideration should be given to instituting a world search for particular genetic characters which could be incorporated in our flocks. For example, a higher fertility rate in sheep depastured in the tropics is obviously needed.

The Cattle Husbandry Branch is seeking to emphasise the importance and magnitude of seasonal fluctuation in nutrition by installing weighbridges at selected centres where regular weighings will be carried out. Fourteen such weighbridges have now been installed. Although this project is in its very early stages it is apparent that the general pattern of the cattle industry is that stock make a net gain in weight only during the four summer-autumn months. Around May they commence to lose weight as pastures deteriorate and they continue to lose weight for about four months; in the third four-months period they regain the weight they lost in the second four-months. Such a halting rate of progress is anything but satisfactory and the first problem is how to arrest the winter seasonal decline in weight; if that could be achieved beef production (and milk production) must rapidly increase.

Since the problem is one of nutrition it can be attacked in two ways—by improved pastures and the conservation of hay and silage. As indicated elsewhere some 160 pasture trials and 80 pasture demonstrations are in progress, whilst demonstrations of hay making are being carried out. Operating costs of grass hay conservation have been about 30 shillings per ton, with a yield of 15-25 cwt. of hay per acre.

Other research work in progress in the Cattle Husbandry Branch includes mineral deficiences, diagnoses and correction, grazing habits of cattle, calf feeding, early fattening and the important question of sterility in dairy cows.

The chief advance in the field of animal research has been the acquisition of a property at Rocklea close by the main laboratories of the Animal Research Institute at Yeerongpilly. When facilities have been developed this property will provide opportunity for research into many pressing problems of animal husbandry and nutrition. A herd of identical twin heifers now being assembled will speed up investigations since a test carried out with a single pair of identical twins is as reliable as one carried out with tens of the usual variable run of cattle.

The number of dairy cattle now under T.B. test increased by 120,000 to 520,000 and with one or two exceptions all important centres of population virtually have a T.B.-free milk supply. An important result of this T.B. eradication campaign is the fact that over 30 fully qualified veterinary practitioners are now resident in rural areas and available for consultation by farmers and pastoralists.

A particular effort is being made to obtain more effective control of the bovine disease contagious pleuropneumonia. This disease is enzootic in the north-western and Northern Territory breeding areas and, quite apart from its direct effect on the well-being of the cattle, restrictive measures on the movement of stock have been imposed by Victoria and New South Wales. Fully effective control is impossible in the present state of poor subdivision of the large runs but immediate contact is being made with the owners of all diseased stock slaughtered at abattoirs, two special extension officers have been appointed in the north-west, and a renewed laboratory study is being made of methods of diagnosing the disease in its quiescent condition.

Problems of more effective disease control, mineral deficiencies, sterility, mineral poisons, and plant poisons have been studied in the research laboratories, while a great deal of time has been devoted to the study and testing of the new insecticides which the chemists turn out at an unabated rate.

The cattle tick remains the chief problem and is to be the subject of a special overseas visit by the Director of Animal Industry. Upon his return it is proposed to intensify the research work on this important pest. The development of a race of ticks resistant to arsenic has long been known and resistance to BHC has been observed in certain areas; so far there has been no evidence of acquired resistance to

DDT but this must of course always be regarded as a possibility. Consequently the testing of all available new insecticides must go on.

The decline in price of coarse grains makes them cheaper to buy than wheat and demonstrations have been carried out to show how sorghum and maize can be substituted for wheat by poultry farmers. These results have been passed on to the industry. The relative productivity of pure poultry breeds and cross breeds is being tested, antibiotics are being thoroughly tested and a special study of poultry diseases is being made. A high percentage of deaths among laying hens is regarded as "normal' in the industry and is undoubtedly an important factor in lifting costs of production. Problems of nutrition and general health can now be studied in the new poultry section at Rocklea.

A piggery section has been established at the Hermitage Regional Experiment Station near Warwick, and a Berkshire herd is being assembled. This piggery will not be run in association with a dairy herd and *inter alia* will serve to explore the economics of pig raising on a grazing-grain basis on the Darling Downs.

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The sample submitted should be representative of the bulk and a covering letter should be sent advising despatch of the sample.

MARK YOUR SAMPLE

Sample of ..... seed
Drawn from ..... bags
Representing a total of .....
Purchased from .....
Name and Address of Sender
Date.....

SIZE OF SAMPLE

Barley	8 oz.	Oats	8 oz.
Beans	8 oz.	Peas	8 oz.
Grasses	2 oz.	Sorghum	4 oz
Lucerne	4 oz.	Sudan	4 oz.
Millets	4 oz.	Wheat	8 oz.

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Blady Grass and its Control by Mowing on the Atherton Tableland.

By S. R. WALSH (Adviser in Agriculture) and W. G. STEELE (Senior Adviser in Agriculture).

Blady grass (*Imperata cylindrica* var. *major*), which is native to Australia, is widely spread in Queensland and covers many thousands of acres from the southern border to Cape York Peninsula. It is found most commonly in open forest and on cleared scrub lands adjacent to the eastern coast.

Blady grass is a stiff, erect perennial, growing from one to three feet in height. The leaves, which are longer than the stem, are erect, hairy and coarse, with sharp margins which give real meaning to the name "blady grass." The cylindrical seedhead varies from two inches to eight inches in length, and is silvery white in colour, with long, silky hairs.

In common with many perennial weeds, blady grass has more than one means of propagation. In addition to seed, the grass produces a dense mass of rhizomes, or underground stems, which grow out from the parent plant. It is by this latter means that blady grass frequently spreads outwards in a circular fashion. The rhizomes may be found at depths of 12-18 in. in deep soils. They are capable of piercing and passing through the roots of other plants which may be encountered by the growing root tip.

Economic Importance.

Blady grass thrives best in the heavier rainfall areas of the State, but it also grows in districts with lighter rainfall, and occurs in most areas having an annual precipitation in excess of about 28 in. Because of its rapid spread by both seed and rhizomes it quickly overruns natural pasture land if control is neglected.

After fire, blady grass is readily eaten by stock for a short period in its very young stage, but regrowth is grazed by stock for only three to four weeks before it becomes coarse and unpalatable.

Table 1 shows that on the basis of chemical composition, it compares favourably with some of the sown pasture species, but the table does not indicate the degree of harshness of the foliage.

Wherever it occurs in Queensland, blady grass can be regarded as a pasture weed. Its prolific rhizomes make it more resistant to fire than most other pasture species, with the result that constant burning of pastures in which blady grass is established assists in its spread.

TABLE 1.

Composition of Various Grasses on Moisture-free Basis.

Grass.	Protein.	Fat.	Carbohydrate.	Fibre.	Ash.	CaO.	P_2O_5.	Remarks.
	%	%	%	%	%	%	%	
Blady grass ..	14·8	2·0	..	34·8	..	..	..	Before flowering
Blady grass (roots only)	6·0	0·9	45·1	26·6	..	..	..	Both fresh and old rhizomes
Guinea grass ..	10·0	0·8	..	32·8	..	..	..	Before flowering
Guinea grass ..	6·8	1·0	37·2	26·3	10·9	0·54	0·59	Mature growth
Rhodes grass	4·3	0·8	49·8	35·9	9·2	0·358	0·337	Grown on forest soil, 3 months old
Rhodes grass	7·1	0·9	47·5	34·8	9·7	0·409	0·229	Grown on scrub soil, 3 months old
Rhodes grass	16·4	1·7	..	27·1	..	1·12	0·72	Young leafy growth
Paspalum ..	20·6	1·6	..	23·7	..	0·41	0·62	Short young growth
Paspalum ..	4·1	0·9	..	41·4	..	0·24	0·14	Old stemmy growth
Buffel grass ..	18·0	1·6	40·7	27·0	12·7	0·953	0·670	Young growth
Queensland blue grass	10·0	1·1	42·5	33·1	..	0·54	0·55	Green, in seed

Distribution on the Atherton Tableland.

On the Atherton Tableland, blady grass has infested pastures over the whole of the area, but principally from Tolga to Millaa Millaa and south-west to Ravenshoe. It is a more serious pest in the dairying districts, particularly where cultivation is not possible. Blady grass is found on the banks of most creeks and has infested some of the slopes and flatter areas. Extensive tracts in forest country, which are used for grazing and burnt annually, are now exclusively blady grass.

The main sown pastures subject to invasion are paspalum and, to a much lesser extent, kikuyu.

The spread of blady grass can be attributed to several causes. A major factor is the deterioration of the pasture due to selective grazing. Incorrect pasture management with paddock areas too large for frequent rotation leads to the better grasses being eaten out. Soil erosion and lowered soil fertility also play an important part. As the fertility of the soil decreases, the better grasses lose vigour and weeds are able to invade the pasture.

Another very important factor has been the damage caused in the Peeramon, Malanda, and Atherton areas by white grub infestation. Paspalum was totally killed by the grub, and large areas were left completely bare. It was under these circumstances that blady grass and other weeds first gained a foothold on many farms.

Methods of Control.

Correct methods of pasture management will do much to prevent the spread of blady grass, and the problem of eradication will not arise. The practice of subdivision and rotational grazing reduces the weed problems in pastures to a minimum, while at the same time the stock have more frequent access to fresh pastures, and each paddock is spelled for a period between grazings. The use of pasture harrows to spread animal droppings also assists materially in building up the soil fertility.

Where an area has been invaded by blady grass, several methods of eradication may be possible. If the infested area can be cultivated, ploughing will give good results. In the maize districts of the Tableland and in some

Plate 1.

General View of Blady Grass Control Experiment on the Atherton Tableland. Prior to the commencement of the experiment the whole area was similar to the two untreated plots in this picture.

parts of the mixed farming areas, it is possible to rotate pasture with crops, and on farms in these districts blady grass can be controlled easily. Ploughing of small patches in the wet season and re-seeding to a pasture, such as paspalum or molasses grass, will also give good results.

Successful regeneration of the desirable pasture grasses has also been obtained on the Atherton Tableland by mowing. Some advantages of the mower as a means of control are—

(1) It can be used on small areas economically.

(2) The soil is not exposed to erosion.

(3) Fairly steep land can be treated.

In the initial stages of infestation, the blady grass is usually present in small areas surrounded by a fair stand of pasture, while in most blady grass patches there is usually found some paspalum or other desirable pasture species. The object of mowing is to weaken the stand of blady grass, and assist in the establishment or regeneration of the pasture.

Trials on the Atherton Tableland have shown that, by mowing each time the blady grass reaches six inches in height, a dense stand of blady grass, in which other grasses form less than 10% of the pasture, can be changed in 12 months to a pasture in which blady grass forms only 10% of the sward. Furthermore, mowing as infrequently as three times per year can reduce the blady grass in the same type of stand to 16% of the stand. In these trials paspalum was the grass which replaced the blady grass.

Where the stand of blady grass is very thick and has been burned over

a period of years, and the stand of pasture grasses is insufficient for regeneration, burning and re-seeding will be necessary. Burning alone will only thicken the stand of blady grass, and it must be followed by mowing to assist the sown grasses.

The main point is that once commenced, the mowing must be carried through, with the object not so much of killing out the blady grass immediately as permitting the regeneration of the natural pasture or the re-establishment of new pasture.

Costs of Treatment.

The cost of mowing blady grass would in general be higher than normal mowing, as the scattered blady grass clumps entail additional travelling from one patch to another and this limits the acreage mowed each day. Also, in many instances the blady grass is growing round stumps and logs, often on stony ground, which makes it necessary to clear the land before mowing can occur.

In estimating the costs of mowing, allowance should be made for the time involved in travelling between, and in turning on, small areas of blady grass, and a mowing rate of one acre per hour has been taken as a basis.

The following labour and fuel costs (1953 level) are based on an average farm tractor and a 6 ft. mower; adjustments would have to be made for horse-drawn mowers. Variation in the costs will be expected, depending on the size of the area to be mown. Small areas involving travelling will increase the cost per acre.

Labour: £2 10s. per day = 6s 3d. per hour = 6s. 3d. per acre.

Fuel (power kerosene) = 2s. 7d. per gallon = 2s. per acre.

Total Cost = 8s. 3d. per acre.

No allowance has been made for capital outlay or depreciation, as the amount which should be debited against blady grass control would depend on the proportion of the total

Plate 2.

Close-up of Portion of Blady Grass Control Experiment. The tall plot on the right has not been mown, while the plot in the left foreground has been mown three times per year.

Plate 3.

Blady Grass Plot Which Has Been Mown Three Times Per Year, Giving 83.5% Control. The taller tussocks are blady grass, the rest of the ground cover being mainly paspalum.

working time of the machine which is devoted to this work.

On the basis of these figures, the labour and fuel costs for a year's treatment by two effective methods and their relative efficiency are compared below:

Treatment.	Cost per Acre.	Control Effected.
	£ s. d.	%
Mowing when blady grass reaches six inches in height. This may involve mowing 10 times per year	4 2 6	90
Mowing three times per year	1 4 9	83·5

Bearing in mind the costs of the various methods, that of mowing three or four times per year gives the most economical results. After the initial mowing, it may be necessary to give another mowing within four to five weeks, particularly during the wet season. It is important that the second mowing should occur before the blady grass flowers and seeds.

The results of work on the Atherton Tableland have shown that—

(1) Control of blady grass can be successfully achieved by mowing.

(2) Mowing three times per year has given 83.5% control, while more frequent mowings gave a greater degree of control at a higher cost. Time of mowing is important.

(3) On areas which have been previously burnt at frequent intervals, and which have no surviving useful pasture species, burning and re-seeding are necessary before commencing mowing.

(4) Controlled grazing will help to lessen the invasion of blady grass into pasture and assist in the regeneration of natural pasture.

It is known from experience that this technique is also effective in the Mary Valley, and it can be expected to be of value wherever blady grass occurs as a weed of pastures in the State.

CONTROL OF BLADY GRASS BY MOWING.

In the light of these results, a programme for the control of this pasture weed by mowing has been drawn up. It has been divided into the following six phases:—

(1) Burn the blady grass to facilitate the clearing of stones and the marking of stumps and other large obstacles. This phase is necessary on densely covered areas known to be stony or not fully cleared.

(2) In the event of re-seeding being necessary, the seed should be sown immediately after burning. This burn should be delayed as late as possible in the season (until late December) to ensure storms on the freshly sown seed.

(3) Commence mowing as soon as the blady grass reaches a height of 12 in. and before it flowers.

(4) If the area is not burned and the natural pasture will regenerate, give the second mowing as soon as the blady grass reaches 12 in. in height.

(5) Continue mowing until the pasture is strongly re-established and control of the blady grass achieved.

(6) Control the stocking, using rotational grazing. This is essential for the welfare of the pasture being regenerated.

Plate 4.

This Plot Was Mown Whenever the Blady Grass Reached 6 in. in Height. This treatment required 10 mowings in a year and gave 90% control of the blady grass.

Grass Hay: A Recent Example of Conservation in the Beaudesert District.

By W. J. WHITE, Adviser in Agriculture, Beaudesert.

The value of good grass hay as a fodder is overlooked by many farmers. In Queensland, during a good season, areas of valuable grasses are allowed to mature and are very often burnt when they could be conserved at very little cost per acre.

Well-grown grasses cut in the leafy stage before commencing to dry out will make excellent hay, which, if fed with a concentrate, will provide valuable feed during winter and drought periods.

At Nindooinbah homestead in the Beaudesert district, following the good rains during January and February of 1954 a very lush growth of paspalum came away on the aerodrome strip. This strip is one which is maintained on the property as an emergency landing field. It lies on a fertile alluvial flat of the Albert River. Similar country comprising hundreds of acres is found throughout the district.

The grass was cut during favourable weather conditions (April 12-15), allowed to cure, and baled. The baled hay was stored in a shed adjacent to the area.

Details of Yield.

Area: 28 acres—Paspalum with some forest blue grass.

Number of bales: 1,450.

Average weight: 65 lb. per bale.

Total weight: 42 tons of hay.

Yield per acre: 1.5 tons of hay.

Costs.

3½ days, 5 men at £2.10.0 per 8-hour day	43	15	0
Baler, 10 gallons petrol ..	1	13	4
Ferguson tractor, 16 gallons petrol	2	13	4
Truck, 4 gallons petrol ..		13	4
Fordson tractor, 14 gallons kerosene	2	2	0
Oil, approximately 2 pints		4	0
Total costs	£51	1	0

On the above basis, the cost of conserving this fodder, excluding depreciation of machinery, was approximately 24s. per ton. A word of explanation, however, should be given about the labour involved. The work was carried out in 3½ days, and a labour force of five men was allotted to the job. But in the initial stages of mowing and raking only two men were employed. The actual labour involved therefore was only 14½ man-days, which would reduce the cost of conserving this fodder to just over £1 per ton.

Analysis of the hay revealed a crude protein content of 7.5%, which should meet the maintenance requirement of dairy stock. Fibre percentage is somewhat high (33.8%), but phosphate content (.43% P_2O_5) is quite satisfactory.

Benefits Following Mowing.

Following the mowing of this area, a very lush regrowth of both paspalum and white clover came away, the clover build-up being entirely due to the removal of the heavy, taller grass growth. Had the original body of grass been allowed to stand, much of it would have been wasted, its quality would have deteriorated rapidly after maturity, and clover development would have been almost entirely suppressed.

Twenty forward bullocks were grazed on the 28-acre strip for a period of six weeks and were sold in prime condition.

There is considerable scope in Queensland for conservation of surplus fodder along the lines indicated above. This case, like a number of others which could be quoted, shows that the costs of conservation are far below the purchase price of fodder of similar nutritive quality.

Plate 1.

Portion of the Blue Grass and Paspalum Flat at Nindooinbah, Beaudesert, on which the Grass Hay was Produced. In this section of the flat (which was uncut) blue grass predominates, whereas on the area regularly cut as an airstrip, paspalum is dominant.

Plate 2.

The Automatic Pick-up Baler Operating on the Grass Hay After it has been Mowed and Windrowed.

Plate 3.

Baling and Transporting the Grass Hay. The bales are being transported on a trailer with a power-loader. The effectiveness of the pick-up operation is shown by the clean state of the strip after the baler has passed over it.

Plate 4.

The Alluvial Flat at Nindooinbah on Which the Grass Hay Was Conserved. The aerodrome strip can be seen running obliquely through the centre of the picture. The hay was stored in the galvanised iron shed in the left middle-distance.

IN APPRECIATION.

As the end of 1954 approaches, it is an appropriate time to look back on the Department's operations during the year.

One thing that stands out prominently is the very valued co-operation extended to the Department by numerous primary producers, by producers' organisations, and by others.

Though the Department operates nearly twenty experiment stations throughout the State, it must have facilities available to it on private properties if the results of research are to be fitted to local conditions.

Similarly, for the purposes of widely demonstrating approved farming practices, it is necessary to have the co-operation of the farming community.

Again, the success of the Department's crop reporting service depends on the good offices of a large number of farmers whose reports on crop plantings and progress form the basis of the Marketing Division's crop reports.

It is very gratifying that during the year hundreds of farmers have given their co-operation to the Department in the ways I have mentioned. Their assistance is much appreciated, and I take this opportunity of expressing to them, on behalf of myself and fellow officers of the Department, sincere thanks and seasonal greetings.

Our good wishes are extended to all who have given assistance during the year.

ARTHUR F. BELL, Under Secretary.

Propagating the Athel Tree.

By A. M. RICHARDSON, Adviser in Horticulture.

Nowadays, fruit growers and market gardeners are taking a keen interest in windbreaks and shelter belts for the protection of cultivated crops and for the beautification of the farm. Since trees planted for these purposes may be expected to last at least a lifetime, the selection of suitable species calls for careful thought.

To meet the many requirements of a good shelter belt, the selected tree must be evergreen, drought resistant, and very frost hardy, and the planting material must be readily available. Perhaps the tree that most nearly measures up to most of these specifications is the athel tree (*Tamarix aphylla*). A native of Northern Africa and widely grown in the Mediterranean countries, it has proved to be a useful tree in Queensland under a wide range of soil and climatic conditions.

Adaptability of the Athel Tree.

When planted in a correctly designed windbreak for farm or orchard or when used as a protective screen for farm buildings, it is a valuable asset. Beautiful in form, with soft, grey-green colouring, the athel tree tolerates wind, drought and low temperatures to a remarkable degree. Whether planted in groups or in formally designed protective rows, few trees equal it.

Unfortunately, the athel tree does not transplant as easily as its general hardiness and ease of propagation would indicate. A successful planting can only be secured by producing strong, well-rooted plants in the nursery, by carefully transplanting in the autumn and by supplying good cultural conditions during the first year or so until the young trees are well established and have made strong bushy growth which forms a shade and weed-suppressing canopy.

Selection and Preparation of Cuttings.

As planting stock is usually plentiful, some care should be used in selecting planting material.

For general purposes, cuttings of firm wood, preferably about the thickness of a pencil or a little larger, are taken in the spring when growth is active. These cuttings should be selected from the upright growing portions of the tree and should be fairly mature wood of the previous summer growth. Soft, immature, green wood is usually slow to "strike" and often unreliable. Cuttings from lateral branches of the stock tree do not strike as readily as those from more vigorous upright growth.

The foliage is stripped from the selected shoots, which are then cut into sections approximately four inches in length. Short cuttings are easier to handle than long ones and they can generally be relied on to root satisfactorily.

Before planting, the cuttings should be stored for approximately 10 days in coarse, moist sand which should not be

Plate 1.

A Windbreak of Athel Trees at Gatton Irrigation Research Station. These trees are three years old.

allowed to dry out. At the end of this period numerous multiple side buds have thickened and developed into root buds. At this stage the cuttings are transferred to the nursery.

Planting in Nursery.

The site of the nursery should be in full sunlight, and some fine, well-rotted manure can be added to the soil to encourage the production of fibrous roots.

Once they are lifted from the storage boxes, the cuttings should be immediately planted in nursery beds without any exposure to wind or sun; any drying out of the cuttings at this stage will cause failure to strike. Planting distances of four inches between plants with the rows spaced 18 inches apart will give ample room for cultivation and root development. Cultivation and handling of the growing plants are facilitated if the rows are carefully marked out.

Using a planting line, the cuttings should be inserted into the soil to a depth that leaves not more than half an inch of each cutting exposed. No firming of the soil is required at this stage, the cuttings being settled in by a generous watering. Subsequent watering should take place at regular intervals; the important thing to remember is that the soil should not be allowed to dry out.

Care of Nursery Trees.

The cuttings should strike very quickly when planted in spring, and if inter-row cultivation is carried out and the beds are kept reasonably moist, the summer growth should be vigorous. When the plants are about 12 inches tall they tend to develop a long and undesirable root system. This development can be corrected by root pruning with a sharp spade which is inserted on both sides of the plant and about six inches from the main stem. This practice encourages the development of a fibrous root system and greatly aids in the later transplanting work. The beds should receive a thorough soaking following this treatment.

Where the proposed windbreak or shelter belt is within easy reach of the nursery, the young trees receive no further attention apart from maintenance until they are transplanted. If,

Plate 2.

A Close View of Well Grown Athel Trees.

however, the young trees have to be transported some distance later, or are likely to encounter major hazards when planted out, they should be transferred to earthenware pots or metal containers, headed back to a height of six inches and watered immediately. They are then kept in the nursery and allowed to re-root before transplanting.

Planting Out.

When cuttings are planted in spring, the young trees should be fit for removal to their permanent positions in February or March. The transplanting check at this time of the year is slight, there is usually ample moisture in the soil and temperatures are favourable for rapid establishment.

Open-rooted trees must be kept moist when they are lifted, as drying-out of the roots before transplanting is harmful and lessens the chances of a successful "take". Young trees supplied in containers are transplanted with the soil around the roots.

In both cases the trees should be set out in well-prepared ground, the soil being well firmed around the roots in such a way that each is placed an inch or two deeper in the soil than it stood in the nursery bed. The trees will then sit in shallow basins, which facilitates watering. The trees should, of course, be well watered immediately after they are set out in the field.

After transplanting, the trees should be cut back immediately to at least six inches from the top of the cutting. Reduction of the top growth at this stage goes a long way towards ensuring successful transplanting and also encourages the development of a strong, low-branched tree of the type preferred in windbreaks.

Although the athel tree is hardy when established and thrives under a wide range of climatic and soil conditions, neglect after transplanting is frequently responsible for disappointing results and sometimes complete failure. On the other hand, if the young trees are regularly cultivated and, where necessary, watered during dry periods for a year or so losses are few, particularly if they are planted closely to provide an early soil cover and inter-tree support.

The Honey Flora of South-eastern Queensland.

By S. T. BLAKE (Botanist) and C. ROFF (Adviser in Apiculture).

(*Continued from page 224 of the October issue.*)

Red Bottle-brush.

Botanical Name.—*Callistemon viminalis* (Sol. ex Gaertn.) Cheel.

Other Common Names.—Red tea-tree, river bottle-brush.

Distinguishing Features.—A tree of creek-sides with rough dark grey bark, usually weeping branches, narrow leaves, and thick red spikes of flowers with stamens much longer than the petals (Plates 100-101).

Description.—This is a tree up to about 30 ft. in height but often much smaller and usually somewhat scraggy. The bark is dark grey and furrowed. The smaller branches are long, slender and drooping. The leaves are dull green, tapered to each end, on very short stalks, with a prominent midrib; they are about 1½-2½ in. long and ⅛-¼ in. wide, about 7-10 times as long as wide. The flowers are densely packed in red spikes 3-6 in. long and about 2 in. wide; they have a small green ovary at the bottom, 5 small greenish sepals, 5 small whitish, rounded petals and a large number of long red stamens with a central red style. The seed-capsules are rounded and about ½ in. wide.

Distribution.—Red bottle-brush is common along the banks of rivers and creeks throughout eastern Queensland and north-eastern New South Wales.

Usual Flowering Time.—August-October.

Colour of Honey.—Medium amber.

Importance as Source of Honey.—Minor.

Importance as Source of Pollen.—Medium.

General Remarks.—Typical of the *Callistemon* group, this spring-flowering species provides nectar and pollen at a time when both these bee foods are needed for the early and full development of the colonies.

The honey has weak density and poor flavour. The granulating qualities are unknown.

Plate 100.

Red Bottle-brush (Callistemon viminalis). Branchlet with flower-spike and leaves.

Plate 101.

Red Bottle-brush (Callistemon viminalis). Clump at Brookfield.

White Bottle-brush.

Botanical Name.—Callistemon salignus (Sm.) DC.

Distinguishing Features.—A small tree with whitish papery bark, bright reddish young growth, narrow pointed leaves with a distinct midrib, and spikes of white flowers with stamens much longer than the petals (Plates 102-103).

Description.—This is a tree 15-25 ft. high with a bushy crown and a whitish papery bark easily torn away in sheets. The young shoots are bright reddish. The fully grown leaves are somewhat dirty green in colour, fairly stiff, tapered at both ends, with a short stalk and a prominent midrib; they are about 1½-3½ in. long, ¼-⅜ in. wide, and about 7 or 8 times as long as wide. The flowers are densely packed in white spikes about 1½-2 in. long and about 1 in. wide; they have a small green ovary at the bottom, 5 small greenish sepals, 5 small rounded whitish petals, a large number of long white stamens and a central whitish style. The seed-capsules are rounded and about ½ in. diameter or a little smaller.

Distribution.—This tree is widely distributed in forest country in the Moreton and Wide Bay Districts. The trees may be scattered or in groups. It also grows in New South Wales, Victoria and Tasmania.

Usual Flowering Time.—September-October.

Colour of Honey.—Medium amber.

Importance as Source of Honey.—Minor.

Importance as Source of Pollen.—Medium.

General Remarks.—Valuable nectar and pollen supplies are obtained from this tree during spring. The blossoms are worked freely by honey-bees and the bee food gathered stimulates colonies to breed and build up in strength to enable them to take full advantage of the following major late spring and summer nectar flows. The white bottle-brush flowers well shortly after rain has fallen.

Plate 102.

White Bottle-brush (Callistemon salignus). Branchlet with leaves, flowers, buds and seed-capsules.

Plate 103.

White Bottle-brush (Callistemon salignus). Yandina.

A SPECIAL RADIO SERVICE FOR FARMERS

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The COUNTRY HOUR, a special service for farmers, is broadcast DAILY from Monday to Friday through the National and Regional Stations from 12 to 1.

ANIMAL HEALTH

Plant Poisoning of Stock.

By W. R. WINKS, Senior Toxicologist.

Although natural vegetation forms the greater part of the food requirements of Queensland's livestock population, relatively few of the known species of trees are eaten by stock. Not many of our coastal trees and shrubs have any value as a source of "top fodder" even in periods of extreme food shortage.

This fact led to the eradication of native trees to make way for the more useful grasses and herbage. In its turn this has allowed smaller trees and shrubs, together with weeds, to flourish and sometimes to assume pest proportions.

Other plants have escaped from cultivation and have taken control of large areas of land to the exclusion of indigenous flora. Lantana, green cestrum, Datura, Crofton weed, noogoora burr, water hyacinth, groundsel and prickly pear are among the "introduced" plants which have subsequently become pests in Queensland.

It has been recognised since the days of early settlement of Queensland that losses to the livestock industry have been caused by animals eating certain plants, and these plants have been considered as "poisonous" to livestock. Often the health of animals is impaired in such a way that they cannot be fattened, produce milk or reproduce in a normal manner. If this reaction on the general health of the animal is the result of the ingestion of a particular plant, such a plant could be classed as poisonous although death may not result for a long time.

A definition of a poisonous plant given by a South African scientist will serve as a basis for the general discussion of poison plants. He defines a poison plant as "A plant which, when consumed in such quantities as will be taken by animal or man over short or prolonged periods, will exert harmful effects on the system, or cause death by virtue of toxic substance(s) normally contained in the plant."

It is not intended to give a list of poison plants and their effects. Rather the discussion of plants poisonous to livestock will be made under such headings as—

(*a*) Why poisonous plants are eaten.

(*b*) Chemistry of poison plants.

(*c*) Detection of poisons in the body.

(*d*) Prevention and treatment of plant poisoning.

Some reference may be made under these headings to the manner in which plant poisons act on the body, but a general discussion under this heading is beyond the scope of this article.

Many plant poisons are used extensively in medicine, and the very action that makes them poisonous also, when the dosage is controlled, makes them valuable healers. The action of digitalis on the heart is well known. Large quantities of digitalis cause death but in small quantities digitalis is a valuable heart stimulant.

WHY POISON PLANTS ARE EATEN.

Palatability.

Animals eat many of our poison plants because of their palatability. A plant may be brought within the definition as exerting harmful effects on the system if by reason of its palatability it is eaten in quantities sufficient to cause harmful effects.

Lucerne, Queensland's most valuable fodder plant, can cause bloat when eaten in its young stage in large quantities and so must come under the general definition of a poison plant. The high fodder value and ease of conservation of lucerne, however, cause this single poisonous property to be overlooked, and in most cases forgotten.

Similarly with our sorghums: under certain conditions they are poisonous to livestock, yet their ability to produce a crop under adverse conditions and their ready conservation for later use eclipse the poisonous property and they are among our most useful stock feeds.

Availability.

The availability of plants is another factor in determining why poison plants are eaten. Some plants can be eaten in small quantities for a long time without harmful effects. If, as a result of drought conditions, such plants become the only food available, their ingestion in large quantities over a fairly long period may produce harmful effects followed by death. The paddocking of animals on cultivated land after the removal of a crop often makes plants available which would be rejected or eaten in small quantities under conditions of normal grazing.

As the amount of land under cultivation has been increased, the areas available for grazing have been correspondingly reduced. On many properties the land remaining for grazing is generally inferior and the vegetation it produces is such that the animals would reject it if better grazing were available.

Deficiency.

A deficiency of some necessary element or substance in the diet of an animal may induce it to eat plants which it would normally reject. This depraved appetite is not only manifested in the eating of poison plants, but substances such as dirt, bones and tins may be eaten in an effort to make good the substances lacking. A deficiency of fibre in a diet may lead to the consumption of leaves and twigs of poisonous shrubs.

Starvation or Deprivation of Food.

Hungry animals will eat almost any plant available. Many of the deaths of travelling stock are due to plants being eaten which are usually rejected. Heavy mortalities were caused some years ago in south-western Queensland when travelling stock were camped on a site with wild tobacco (*Nicotiana* sp.) as the dominant plant.

Accident.

Poisonous plants are sometimes eaten by accident. Noogoora burr seedlings growing amongst grass on creek banks and eaten accidentally along with the grass have been responsible for stock deaths. Seeds of plants such as Datura harvested with wheat and Datura plants themselves harvested with hay crops can cause death. The presence of the poison plant could be regarded as accidental.

A potential danger, not yet confirmed, is the presence of volunteer linseed plants amongst oats or other hay crops.

Spraying.

Sprayed plants sometimes become attractive to stock as a result of the saline residues left on the plants. If the spray used is a poison such as arsenic, death may result. There is some evidence that the newer hormone-type weed killers tend to increase the amount of nitrates in some plants, and if the residues themselves have a saline flavour the dying plants may be dangerous.

CHEMISTRY OF POISON PLANTS.

Although many plants are known to be toxic, the active or toxic principle has been isolated from relatively few. One portion of the plant may contain poison and the remainder may be free from poison. The leaves and seed kernels of the peach contain prussic acid, while the fruit may be eaten with impunity.

Plants which cause mechanical injury to the digestive tract (for example, by their thorns, or in the case of fibrous plants by causing impaction) could be classed as poisonous.

Chemical substances, however, constitute the greater proportion of the active principles of poison plants and these substances may be divided into two classes:—

(1) Those derived directly from the soil.

(2) Those formed in the plant during its growth and nutrition.

Plant Poisons Derived Directly from the Soil.

While there are a number of elements which are necessary for plant growth, most of them are not present in the plant in sufficient quantity to harm stock. For the most part, before they could reach a level in the plant at which they could be harmful to stock, if eaten, they would probably cause the death of the plant itself.

Two trace elements—molybdenum and copper—do reach concentrations in some plant species sufficient to cause injury to livestock. Teart, a well-known disorder of stock in parts of England, arises from grazing pasture high in molybdenum. Similar high levels have been found in parts of Queensland, but the scouring disorder so characteristic of molybdenum toxicity is not present. This may be due to two countering factors—one copper and the other potassium sulphate. Copper antagonises molybdenum and the sulphate accelerates its excretion.

Nitrates can be taken up from the soil and can reach a concentration in a plant sufficient to cause the death of stock consuming the plant. Mintweed (*Salvia reflexa*) poisoning is due to the potassium nitrate which it contains.

Cultivated plants such as wheat, oats and mangolds sometimes accumulate dangerous amounts of nitrates, particularly in areas deficient in molybdenum and manganese.

Arsenic can be taken up from the soil in relatively large amounts without killing the plant, but so far we have no definite evidence that healthy plants containing relatively large amounts of arsenic have killed stock.

In U.S.A. a disease known as selenium poisoning results from the eating of plants growing on soils containing traces of selenium. This substance when taken up by wheat and maize causes disorders in breeding among fowls fed on the grain.

Selenium poisoning has been suspected in Queensland but there has yet been no definite confirmation of these suspicions. Many of our mineral bearing areas are seleniferous, so it is possible that evidence of selenium poisoning may yet come to hand. A substance similar to selenium, namely tellurium, has been known to taint meat from cattle reared in one particular district in Queensland.

Poisons Formed as a Result of Processes Which Produce Plant Growth.

Most of our cases of plant poisoning come from poisons produced by the plant during normal growth.

These poisons fall into a number of groups, such as glycosides, essential oils, oxalates, fluoracetates, alkaloids, miscellaneous and unknown.

Glycosides.

The glycosides and alkaloids together contain the majority of compounds known to be responsible for plant poisonings.

The glycosides are compounds which contain various sugars combined in their molecule. Not all glycosides are poisonous, and indeed they exist in small quantities in nearly all plants, especially in roots, fruits and bark. They are contained in the colouring matter of many fruits and flowers. Glycosides which affect the heart are contained in oleander and in the wild cottons (species of *Asclepias*).

When the sugar part of the glycoside is glucose or grape sugar, the glycosides are called glucosides, and when the glucose is combined with hydrocyanic or prussic acid the glycosides are known as cyanogenetic glucosides.

Cyanogenetic glucosides are contained in sorghums, peach (leaves and kernels), passion fruit skins, some clovers, cassava, wild fuchsia (*Eremophila*) and many other plants, but with reasonable care mortalities can be avoided. The amount of prussic acid in the plant varies with the stage of growth, the part of the plant, the locality in which the plant is grown, the climatic conditions during growth, the fertility of the soil and even the time of the day. Most animals can tolerate small regular quantities of hydrocyanic (prussic) acid for long periods, but large quantities of cyanogenetic plants eaten at one time can be dangerous.

Members of a group of glycosides which form soapy solutions with water are called saponins. Saponins cause haemolysis—that is, destruction of the red blood corpuscles and the liberation of the haemoglobin of the red corpuscles into the fluid with which they are surrounded.

The Moreton Bay chestnut (*Castanospernum australe*) owes its poisonous properties to saponins.

The poisonous principle of the potato (solanine) has many of the characteristics of both alkaloids and saponins and is classed as belonging to both groups.

Essential Oils.

The odour of our common gum trees is due to the eucalyptus they contain. this eucalyptus being a mixture of essential oils. The name essential really means scented. Other Queensland plant families also contain essential oils (for example, the teatree). An essential oil capable of causing death to stock has been isolated from a wild fuchsia (*Eremophila latrobei*) growing in the Georgina River area and suspected of having a part in what is called Georgina River disease. It is possible that at least some of our suspected poison plants will be found, when systematically examined, to contain toxic essential oils.

The refusal of some sheep to eat gidyea unless it is dry or scorched is probably due to the presence of essential oils in the green plant.

Oxalic Acid.

Oxalic acid is present in such plants as oxalis (sour grass or soursob), rhubarb and dock, and has been reported in large amounts in at least one grass. It can cause death if consumed in large amounts and can have indirect effects on the health of animals by interfering with the lime status of the animal.

Fluoracetates.

These are poisons in which elements such as sodium and potassium are combined with fluorine and acetic acid. No plants containing fluoracetates have yet been found in Australia.

Stock deaths in South Africa from what was called gifblaar poisoning were found to be due to potassium monofluoracetate in a plant known as gifblaar.

Sodium monofluoracetate is used in Brisbane, under very strict control, as a rat poison under the name of "1080". There are indications that it may prove valuable in the control of insect pests but its extreme toxicity would preclude its general use.

Alkaloids.

Next to the glycosides, the alkaloids form the largest group of plant poisons. Like the glycosides, many alkaloids are non-poisonous and a great number are used in medicine. Caffeine and quinine are two non-poisonous medicinal alkaloids, while strychnine, cocaine and morphine are among the very poisonous alkaloids which are used therapeutically.

Among the many common plants containing alkaloids we may mention thorn apples, species of *Duboisia* (including pituri), hemlock and the wild tobaccos (species of *Nicotiana*). Everyone associates the alkaloid nicotine with tobacco.

A recent survey by the C.S.I.R.O. has shown that a large number of plant families contain alkaloids, and no doubt more remain to be discovered.

Miscellaneous Poisons.

There are a large number of plants known to be poisonous but from which no poisonous compounds have as yet been isolated.

Green cestrum (*Cestrum parqui*) is a poison plant which has escaped from cultivation and assumed pest proportions in the Brisbane and Ipswich districts. An alkaloid named parquine has been isolated from the species by an overseas worker but has not been obtained from the Queensland variety.

However, workers have been successful in isolating a substance called lantanin from lantana and pteridin from bracken, and both of these plants have been shown to be poisonous to animals. In addition, the poisonous principle of zamia has now been isolated. Subterranean clover, a plant which revolutionised the pastoral industry in southern Australia, has been shown to cause breeding disorders in sheep once the pasture is greatly clover-dominant. The toxic principle is in the nature of an oestrogenic hormone. Oestrogenic hormones are substances previously thought to be produced only in animals, where they play an important part in the function of reproduction.

Another poison plant is one of the indigo family (*Indigofera enneaphylla*), which causes a disease among horses known as Birdsville disease. The active principle has not yet been isolated from this plant.

It will be seen that an enormous field yet remains to be covered before the mysteries surrounding the deaths from many poison plants can be elucidated.

DETECTION OF POISONS IN THE BODY.

The detection of the poisons derived from the direct ingestion of poison plants is not an easy matter. Previously it was indicated that there are many known plants from which the active principle has not been isolated even when material for examination is abundant. It will therefore be obvious that the small amount of material available in the specimens usually submitted for analysis renders the detection of plant poisons in them almost impossible. Such poisons as nitrates, oxalates and selenium can usually be detected, but others are more difficult; hydrocyanic acid, for example, can be found if specimens are obtained immediately after death, but if more than an hour has elapsed since death occurred most of the cyanide will be dissipated.

Plant fragments capable of detection by a botanist can sometimes be found in the rumen (paunch) of an animal, while seeds and harder portions appear in the abomasum or fourth stomach. In the case of suspected plant poisoning, a botanical examination is often more valuable

than chemical tests, and specimens of ruminal (paunch) and abomasal (fourth stomach) contents should always be included whenever poisoning of any kind is suspected.

Portions of the suspected plant (flowers, seeds and leafy stems) should also be submitted.

Where more than one plant is suspected, every suspected plant should be sent. It is advisable to number each specimen sent and keep a numbered duplicate for reference when the botanical identification has been completed.

Should deaths follow the appearance of a plant new to a district, samples of this recent arrival should be sent to the Government Botanist as soon as possible. The time to start on the eradication of a potential pest is at its first appearance.

PREVENTION AND TREATMENT OF PLANT POISONING.

The ideal method of prevention of plant poisoning would be the complete eradication of the plant, but this is seldom practicable or economical. It may, however, be possible to eradicate poison plants from stock routes.

While these plants continue to flourish, the only way to prevent plant poisoning is to exercise care at all times. Thus stock should be denied access to areas in which poisonous plants are concentrated and overstocking should be avoided as much as possible.

The big danger in overstocking is that as the area is eaten out of the vegetation normally consumed by animals they will be forced to eat the poison plants they had previously left untouched or die of starvation.

During drought great care must be taken, especially in the feeding of fodder plants such as sorghum, and grazing for short periods is recommended rather than turning stock into paddocks to graze at will.

TREATMENT.

Animals which are suffering from plant poisoning are seldom seen until it is too late for effective treatment.

If a cyanogenetic plant is suspected a drench of 1-2 oz. of photographic hypo in half a pint of water may be effective if used in time. In this respect it is possible that the natural sulphide waters of our artesian basin may help to prevent poisoning from such plants as wild fuchsia (*Eremophila maculata*) and wild plum (*Ximenia americana*).

It is sometimes possible to prevent plant and mineral poisons from being absorbed through the wall of the alimentary canal into the body by the administration of animal or wood charcoal. The poisons tend to become adsorbed on the surface of the charcoal and this may successfully carry them through the gastro-intestinal tract with little or no absorption into the body having occurred.

Water tends to facilitate the absorption of poisons, so it is usually advisable to prevent animals from drinking when poisoning is suspected. When antidotes requiring water as a solvent are used, it is advisable to restrict the amount of water.

Losses from plant poisoning in Queensland must represent a considerable sum of money every year. Many of the losses will not be prevented until droughts can be prevented, but fodder conservation which ensures at least some feed to animals during droughts can help to overcome the effects of starvation and subsequent consumption of poison plants will be avoided.

When enough fodder is conserved to ensure an adequate ration over all lean periods, the incidence of plant poisoning should fall to a low figure.

Contagious Pleuropneumonia of Cattle.

By D. F. MAHONEY, Assistant Veterinary Officer.

Contagious bovine pleuropneumonia, (C.P.P. or "pleuro"), is the most serious contagious disease which affects cattle in Queensland.

After it was introduced into Victoria by an infected cow which arrived from England in 1858, it spread rapidly through New South Wales and reached Queensland in 1862. Enormous losses accompanied this initial invasion. By 1864, it had been responsible for the death of 160,000 head in Queensland alone, and in the first 15 years of its existence in Australia, it accounted for the loss of 1,400,000 animals.

The southern States have successfully eradicated the disease but the undeveloped cattle country of north and south-west Queensland has remained a reservoir of infection because the particular control measures necessary for the eradication of pleuro cannot be applied there. Thousands of store cattle which annually leave these northern breeding lands often include infected carrier animals which spread the disease to clean areas. Such outbreaks occur in southern Queensland, New South Wales and Victoria. From August 1952 to June 1953 there were 53 outbreaks in New South Wales and 57 in Victoria.

Due to the restrictions of stock movements and to the destruction of infected animals, outbreaks of pleuro, particularly in non-infected areas, cause great economic loss.

Pleuropneumonia also disrupts interstate trade. Cattle cannot enter New South Wales from Queensland unless they have been free from contact with the disease for the preceding 180 days, and then they must be held free from contact with the disease for a similar period in New South Wales before entry into Victoria. Cattle from Queensland cannot enter Tasmania unless they come from herds which were free of the disease for the preceding three years.

Method of Spread.

Pleuro is caused by a minute organism or germ which is present in the lungs and fluids of the chest cavity of every infected animal. It is present in particles of moisture in the exhaled air, and transmission takes place when a healthy beast inhales these infective droplets. Because the disease cannot be spread except through the air, contamination of water, drinking vessels, soil or pasture is not important.

Close contact between infected and healthy stock is usually necessary, but there are instances on record where infection has been carried by air currents for 30-50 yards. A single fence does not provide sufficient isolation to limit the spread of the disease.

The time between infection and the actual appearance of the disease is variable and may be as long as four months.

Symptoms.

Pleuro causes fever which produces dullness, watering at the eyes and loss of appetite. Dairy cattle show a falling off in milk yield, and affected beasts among travelling stock fall back to the rear of the mob. Beasts left on their own seek the shade and generally linger close to water.

The head is held out, saliva drips from the mouth, there is a discharge from the nose and the rate of breathing is increased. Movement of the flanks is pronounced and the animal grunts on breathing out. A soft, heaving cough is often seen; it is more prone to occur after any movement. Sick animals sometimes charge when disturbed.

Later in the course of the disease, the animal stands with its back arched, legs apart, head down and ears drooped. The eyes become sunken and condition falls away.

Swelling of the brisket is occasionally seen.

When exercised, an infected beast shows undue respiratory distress, coughs frequently, and drools copious amounts of saliva from the mouth.

A typical case will show some or all of the symptoms described above but a considerable number of infected cattle exhibit little or no outward signs of sickness even though large portions of their lungs may become diseased. These are known as sub-clinical cases, and for obvious reasons play an important part in the spread of the disease.

Post-mortem Appearance.

The principal changes are seen in the chest cavity. The affected side or sides may contain anything from a few ounces to a few gallons of fluid which varies in colour from amber to a brownish red. Yellow jelly-like clots float in the fluid, while the surfaces of the lung and chest wall are covered with yellow clots in places and adherent in others.

The affected lung is enlarged, firm to touch (like liver) and much heavier than normal. Its outside membrane is dull and thickened.

When the lung is sliced, yellow fluid oozes from the cut surface. This surface presents a marbled appearance, with a network of thick white strands interspersed with dark-red, pink and grey areas.

Changes which take the form of pale blotches on the surface are usually seen in the kidneys.

A beast in the stages of recovery presents a different picture. Most of the fluid disappears and the affected portion of the lung becomes walled off by dense white fibrous tissue. The fibrous network is still present inside the diseased area, but the intervening spaces are occupied by yellow, cheesy material. The part is generally adherent to the chest wall and is known as a sequestrum. The animal, although in may appear normal, is a carrier of the disease and at times is capable of infecting healthy stock.

Origin and Importance of the Carrier.

A carrier is a recovered animal in whose lung a sequestrum has formed. A sequestrum can persist for 10-15 months before complete healing takes place.

In some cases the walling off of the affected part is not complete, and there is a discharge of infective material into the air passages of the lungs. Such animals usually remain unthrifty and are inclined to have a chronic cough. They are known as "lungers" and spread the disease during the time of their convalescence.

In other cases recovery is rapid and the sequestrum becomes completely walled off. There is no escape of infective material from it and the beast shows no sign of illness. However, physical strain, such as a long journey by road, will cause infection to escape to adjacent parts of the lung and bring about a recurrence of the acute disease. This type of carrier is a dangerous spreader of pleuro because it may pass through the hands of many owners before it is finally detected. Unlike the "lunger," it spreads the disease only when it suffers a relapse.

The incidence of carriers has been found to be as high as 15% in the breeding sections of some herds six months after an acute outbreak. They can be detected by a blood test, and although this is used with great success in closely settled districts it cannot be applied on a sufficiently large scale in North Queensland to be of much practical benefit.

Vaccination.

Immunity which lasts for at least a year can be induced in susceptible cattle by introducing a small quantity of vaccine into the soft tissue at the tip of the tail. This vaccine must contain large numbers of the living pleuro-pneumonia organism.

In the early years, it was found that the amber fluid from the chest cavity of an infected animal (natural virus) was satisfactory. However, in 1936 the C.S.I.R.O. culture vaccine

was produced and this is now very widely used. This product is prepared in the laboratory and each dose contains a standard number of living organisms. It is uniform in character and action and properly controlled tests have shown that it is nearly 100% efficient. Eighteen years of field experience have proved its reliability.

Vaccination is a preventive measure and not a cure. As mentioned earlier, pleuro can take as long as four months to develop after infection takes place and vaccination during the incubation period has little effect on the course of the disease. This is why losses often drag on for two or three months after vaccination. A proportion of the animals which were infected beforehand became obvious cases.

The vaccine does not retain its potency indefinitely. Careless handling can also bring about a premature decline in its activity. To obtain the best results the following rules should be observed:

(1) Always store the vaccine in a cool place.

(2) Do not use vaccine after the expiry date on the label of the bottle.

(3) Do not leave full bottles of vaccine in direct sunlight while waiting to be used.

(4) Do not use disinfectants to "clean" needles, syringes, or any other container used for vaccine during the operation.

(5) Discard a partly used bottle of vaccine at the end of the day; do not restopper it for future use.

Methods of Vaccination.

The syringe and seton methods of vaccination are extensively used and the method of choice is a matter for the individual. The seton method is reliable in the hands of a careful operator, but the syringe method is cleaner, quicker, and results in more economical use of the vaccine. It also has the advantage that it can be used in conjunction with dipping operations. If cattle were vaccinated with setons immediately prior to dipping, it is probable that the dipping fluid would destroy the organisms in the vaccine and prevent the development of immunity. However, syringes are liable to develop mechanical faults which may escape notice for a considerable time.

A crush is necessary for efficient vaccination and each beast should be bang-tailed after the injection.

The most suitable type of syringe for vaccination is one which can be adjusted to deliver the correct dose of one-fifth of a cubic centimetre. Syringes of this type are now available. Eighteen gauge needles, three-quarters of an inch long, are favoured.

The operator fills the syringe himself and holds it. An assistant pulls the tail out to the side of the crush, parts the hair on the end and hands the end to the operator. The dose is deposited in the centre of the tail about one inch from its tip.

The seton method consists of inserting a woollen thread soaked in vaccine under the skin of the tail about 1½ inches from the tip. This is done by using a lancet-shaped needle with a slit near its point. The soaked thread is placed in the slit and the needle thrust through the tail and withdrawn quickly, leaving the seton in the wound.

The seton operator requires more assistants than the syringe operator. He should have an assistant attending to the soaking of the setons and the threading of the needles and another stripping or clipping the hair from the end of the tail so that the seton can be inserted without obstruction. With a long crush a runner is necessary between threader and operator.

As the setons are usually soaked in an open container, care should be taken to keep them as free from dust as possible. The needles should be threaded with a pair of clean forceps to minimise contamination with dirt.

Effects of Vaccination.

Immunity is developed three or four days after vaccination. About the same time a swelling which extends for a few inches along the tail appears; this swelling gradually subsides.

Sometimes the swelling involves all of the tail or even the rump. This type of reaction, which is more prone to occur in dairy and stud beef cattle, is called a "bad tail" and generally appears suddenly three to six weeks after vaccination. It is not due to contamination of the vaccine with harmful organisms or to injury of the bone in the end of the tail, but to the reaction of the beast to inoculation. The animal shows signs of illness and death may follow. Losses can sometimes be prevented by amputating the tail at a level above the swelling where free bleeding occurs. If the rump becomes affected, the swelling should be lanced in two or three places to allow free drainage. Large doses of drugs such as penicillin and chloromycetin assist the recovery of such cases. Of all the cattle vaccinated annually in Queensland (approximately 400,000), only a fraction of 1% develop "bad tails."

Young calves sometimes develop lameness and swelling of the joints after vaccination, but this appears to be very uncommon in the infected areas of North Queensland.

Control.

When pleuro is introduced into clean areas, control is undertaken along the following lines:

(1) The property or properties on which cases have occurred are quarantined and a buffer area declared around the quarantine zone.

(2) All cases detected are destroyed.

(3) All cattle in the infected and buffer area are vaccinated.

(4) Quarantine restrictions are maintained until such times as the disease has been brought under control.

(5) When practicable, a blood test is applied to the herds to detect the infected animals and carriers which escape detection.

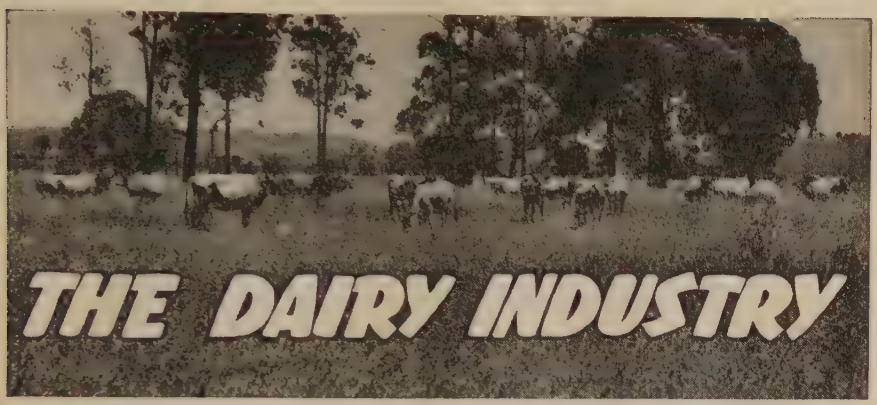
Such measures are designed to prevent the spread of the disease and if possible eradicate it. They are always carried out under the supervision of a Departmental officer.

The disease is endemic in herds in practically all parts of North Queensland and the south-west channel country.

In these areas control is difficult because of the primitive husbandry methods still practised there. Where outbreaks are detected, quarantine restrictions are imposed and vaccination is enforced. However, the application of the blood test for eradication of the disease is obviously impracticable.

The only means by which the overall incidence of the disease can be reduced is by co-operation of stock-owners in carrying out a plan of regular vaccination of their own herds. A programme of annual herd vaccination combined with the destruction of clinical cases would reduce the incidence of pleuro in a herd to negligible proportions over a period of five years. The vaccination of a herd every now and again is not good enough, because the continual infection of young stock is sufficient to keep the disease incidence at a high level.

Those properties which cannot operate to a regular programme should vaccinate all young stock at weaner age and carry out herd vaccination as often as possible.



Milk and Cream Production in Summer.

By E. B. RICE, Division of Dairying.

Milk when it leaves the udder of a healthy cow contains few bacteria. It is not long before others are added. If the herd is hand-milked, they enter the milk on hairs and dirt falling from the cows' coats, the hands of the milker and the various dairy utensils, while in machine-milked herds the chief sources of contamination are the milking machine and other dairy equipment.

Of the numerous species of bacteria which may contaminate milk, only one group, known as lactic acid bacteria, can, within certain limits, be regarded as desirable.

Contamination, Temperature and Storage Time.

If scrupulous dairy hygiene is practised, and the milk or cream is not exposed to high atmospheric temperatures, the lactic acid bacteria will rapidly outgrow other types. However, other bacteria, which gain entry if there is even a slight laxity in milking-shed practices, will rapidly multiply at normal summer temperatures and in doing so will invariably lead to some spoilage of milk and cream quality. The extent of such deterioration depends on the numbers originally present, the temperature to which the milk or cream is exposed and the time of holding on the farm pending delivery to the factory.

The producer of milk for the liquid milk trade must take all steps practicable to restrict bacterial development, as the lower the bacterial content the better will be the keeping quality of the milk.

In milk intended for cheese factory supply, a similar aim must be encouraged, although some multiplication of lactic acid bacteria will still allow good quality cheese to be produced. However, under farm conditions, other organisms will always accompany the lactic acid bacteria and cause quality troubles in warm weather if the milk is held overnight without adequate cooling.

Even with cream intended for butter manufacture, bacterial development must be controlled. In cleanly produced cream maintained within a temperature range of 60-70°, the lactic acid bacteria will predominate over other types and ensure that the cream will be of choice quality on reaching the factory, but higher temperatures favour the rapid increase of undesirable bacteria which soon cause 'off' flavours. Even excessive growth of lactic acid bacteria leads to the defect called 'overripe' cream, and if the casein of the cream is coagulated due to high acidity more serious taints, such as cheesy flavour, will appear.

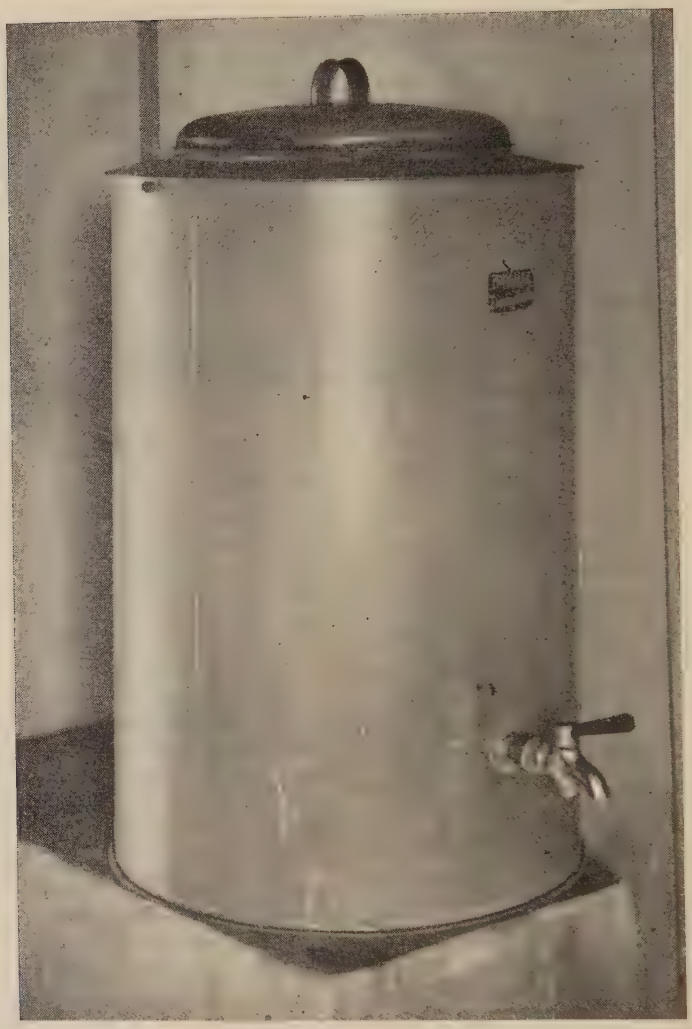


Plate 1.

An Electric Water Heater Suitable for the Dairy Farm.

Control of Summer Quality Troubles.

To control bacteria and their resultant detrimental influence on milk and cream quality during the summer months, it is imperative that particular attention be paid firstly to cleanliness, with particular emphasis on the thorough cleaning and sterilizing of all utensils. This is because the utensils are the most prolific source of the initial contamination of milk and cream.

Secondly, the milk or cream must be cooled immediately after it is produced and kept cool pending delivery to the factory in order to retard bacterial proliferation and particularly the serious quality-affecting bacteria which thrive in warm milk or cream.

Dairy-Shed Methods.

The essential steps in avoiding as far as practicable the spoilage of milk

and cream quality during the summer months may be summarised as follows:—

(1) Maintain a high standard of hygiene during production, giving particular care to the dairy utensils, which should be treated in the following manner:—

(*a*) First rinse away milk residues with cold water.

(*b*) Scrub utensils which are hand-washed with a hot solution of a cleaning compound, or circulate the solution through the milking machine.

(*c*) Near-sterilize with boiling water or steam.

(*d*) Before re-use at each milking, flush out with a chlorine solution prepared according to the directions on the bottle or package.

(2) Cool the milk or cream as soon as it is produced, and keep it cool until forwarded to the factory, by one of the following methods:—

(*a*) Cooling in a dairy refrigerator (this is the ideal system as it will almost completely retard bacterial multiplication).

(*b*) A water-cooling tower system, with an extension to the water pit to hold the milk or cream after it is cooled.

(*c*) Storage of the cans of milk or cream in a concrete trough, placed in the dairy building, through which water is kept constantly circulating.

(*d*) Storage of cream in a charcoal cooling cabinet.

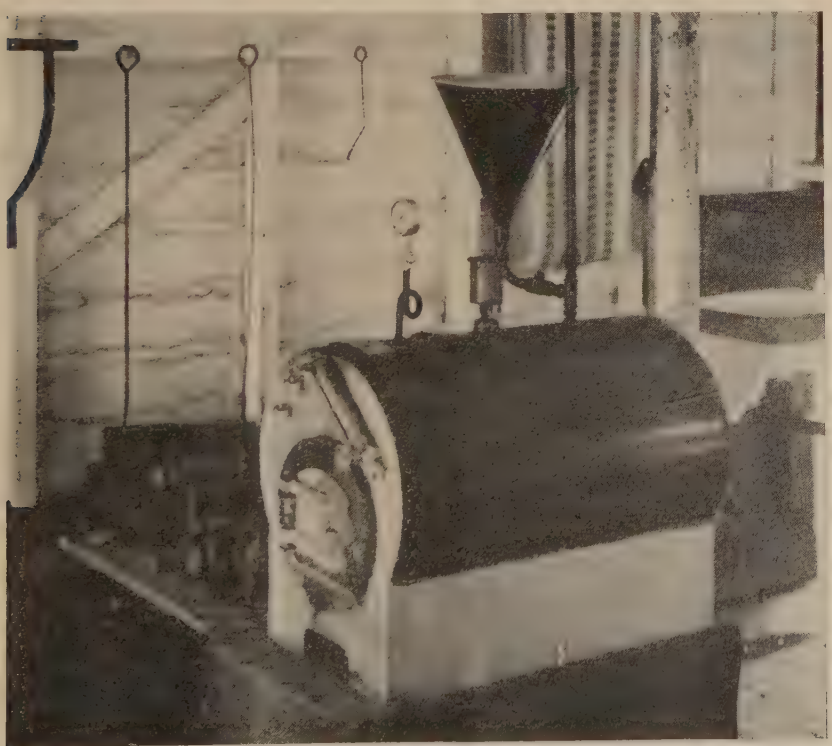


Plate 2.

A Steam Sterilizer for Dairy Farm Use.

Plate 3.

A Water Cooling Tower on a Farm in the Beaudesert District.

(3) Separate cream to contain not less than 38% butterfat, and preferably 40-45%, between the months of October and April, inclusive, as in high-testing cream there is less milk sugar and casein to furnish nutrients for bacterial multiplication.

(4) Deliver the cream to the factory as often as possible; four times weekly during the summer months should be the minimum objective.

The local dairy officer will gladly advise any farmer on the proper procedures for cleaning dairy equipment, including milking machines; on various systems of cooling milk or cream adapted to the specific local conditions; or on any other aspect of dairy shed practices.

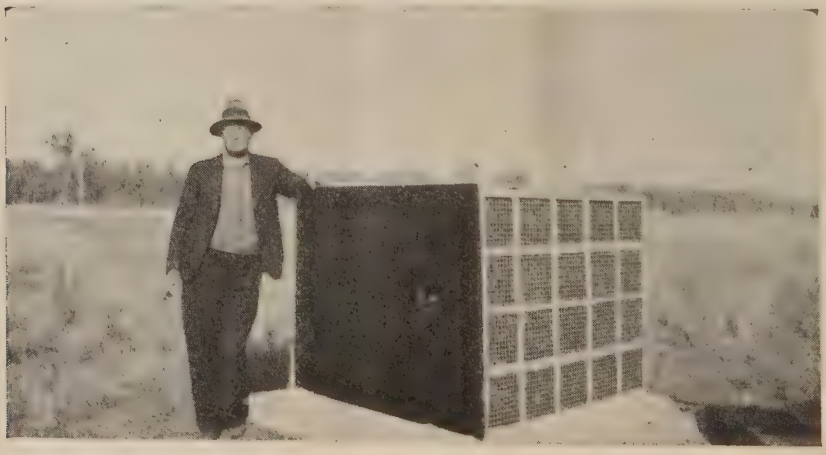


Plate 4.

Front and Side View of a Charcoal Cooler Unit.

Fluorosis of Merino Sheep in Queensland.

Part 2. Studies of Transmission, Water Treatment and Amelioration.

By J. M. HARVEY (Senior Biochemist) and G. R. MOULE (Director of Sheep Husbandry).

Research work was commenced on fluorosis of sheep soon after the condition was recognised. First of all, field surveys were made to find out how serious and widespread was the problem. Work was undertaken at the Animal Health Station, Yeerongpilly. This aimed to find the answers to some of the problems found in the field. The main questions to be answered were:—

(1) Whether ewes which drink water containing sodium fluoride pass enough fluoride on to the lambs they are carrying, or suckling, to cause them harm.

(2) Whether it is possible to remove fluoride cheaply and easily from affected waters.

(3) Whether it is possible to lessen the harmful effects of fluoride in drinking water by feeding the sheep a supplement.

(4) What systems of property and stock management were most helpful in lessening the harmful effects of fluoride in drinking water.

This article deals with the work on the first three questions. The best methods of property and stock management to overcome the effects of fluoride in drinking water will be dealt with in Part 3.

Do Ewes that Drink Water Containing Fluoride Pass it on to their Lambs?

There were two ways that ewes could pass fluoride on to their lambs —either through their milk or with the nutriments required for the normal growth and development before the lambs were born.

The passage of fluorine through milk was examined first. Ewes with day-old lambs at foot were divided into three groups, each of which was given different drinking water. That for the first group contained 10 parts per million of fluoride. That for the second group contained 5 parts and that for the third group contained 2 parts. All the ewes were given the same diet of good lucerne chaff and maize meal.

Milk samples were taken regularly and were analysed for their fluoride content. The milk from all three groups of ewes contained less than 0.2 parts per million of fluoride.

During the following 12 months, the ewes were kept in their three groups and allowed to drink water containing

fluoride. They were mated, and after lambing milk samples were again collected and analysed. The diet was then changed. Instead of lucerne chaff so rich in lime and protein, the sheep were fed poor oaten chaff, deficient in lime and containing but little protein. However, neither the long period the sheep drank the fluorided water nor the changes in the diet influenced the amount of fluoride in the milk. It still contained 0.2 parts per million of fluoride.

The lambs born after the ewes had been drinking water for 12 months were killed when they were six weeks of age. The bones and the teeth were examined and later analysed to find out how much fluoride they contained. Lambs born to ewes that had not been on fluorided water were killed at six weeks of age for examination.

The chemical analysis showed that the bones and teeth of the lambs born to the ewes that received no fluoride, as well as those that drank the water containing 2 parts per million, contained normal amounts of fluoride. The lambs born to the ewes that drank water containing 10 parts per million of fluoride contained much more fluoride. This showed that ewes that drink water containing large quantities of fluoride will pass it on to their lambs. However, this did not affect the young lambs, and it seems that little harm will come to the lambs if their mothers drink water containing 10 parts per million of fluoride. However, abnormal lambs have been born in Queensland to ewes that regularly drank water containing as much as 15 or 20 parts per million.

Can Affected Water be Treated to Make it Safe?

It is relatively simple to remove fluoride from water. However, the process is either slow or involves the use of large quantities of chemicals. Therefore, no cheap and satisfactory methods have been found for the removal of fluoride from artesian water for stock in Queensland.

On the other hand, some methods that will treat small quantities of water for human use are available. The treatment of water in storage tanks with kopi (known chemically as calcium sulphate) involves thorough mixing and storing for several weeks. Therefore, its use in the field is limited.

Can the Effects of Fluoride be Offset by Feeding?

The value of diet as a means of allaying the severity of fluorosis was studied for 2½ years. Work with other animals had shown that diets rich in lime, phosphate and protein reduced the severe effects of fluorosis It was felt that these findings may not apply to sheep, whose digestive system is so different.

Lambs three months old were selected to start the trial. They were fed on oaten chaff, which does not contain very much protein, lime or phosphate. The different groups of sheep were given these substances as a supplement, either singly or in combination. Half the sheep were given water containing 5 parts per million of fluoride. The other half drank water containing 10 parts per million of fluoride. The front teeth of all sheep were examined carefully to see when the first signs of damage appeared. At the end of the experiment all the sheep were slaughtered, and their bones, teeth and some organs were analysed.

All animals used in this experiment showed symptoms of fluorosis and no beneficial effects were obtained from the feeding of supplements rich in lime, phosphate and/or protein.

The damage to the teeth of these experimental animals was less severe than that of sheep grazing natural pastures. The experimental sheep could gather their chaffed or milled food from a trough. They did not have to pull at harsh plants like they do in the paddock. Because they did not have to walk to gather food, and because they were kept in sheds, they did not drink as much water as sheep do in the paddock. Therefore,

although they drank water containing 10 parts per million of fluoride, their total fluoride intake was not as great as it would be out on a property.

Provided everything else is equal, fluoride as such in the drinking water does not interfere with wool production. However, once the teeth have been damaged the animals are unable either to gather or to chew hard feed. As a result they produce less food.

One interesting aspect of the results is of importance to human health. There was no build-up of fluoride in the flesh or edible organs of the animals. Therefore, there is no chance that the eating of mutton from sheep raised on fluorided water will cause fluorosis in humans.

Buying Agricultural Requirements. Protection for Farmers.

The Agricultural Standards Act of 1952, which provides for the control of the quality of agricultural requirements (namely, seeds, fertilizers, veterinary medicines, pest destroyers, stock foods, growth regulating materials and testing reagents) offered for sale, makes provision that a person is not bound to accept delivery of these agricultural requirements unless they comply with all the provisions of the Act. If the buyer considers the goods are of inferior quality, he should refuse to accept same. **All the goods should be examined immediately they are received.**

In order to obtain the full protection of the Agricultural Standards Act, **complaints regarding quality should be made within fourteen days of delivery,** or **within fourteen days of receipt of the invoice.**

The complaint must be made in writing to the seller of the goods and should indicate to the seller that a sample will be taken after a further fourteen days have expired but before twenty-one days from the date of the notice to the seller. Where possible, it is desirable that such sample be taken by an officer of the Standards Branch who is familiar with the procedure for sampling as required by the Act.

A complaint lodged and a sample taken in accordance with the provisions of the Act could be of considerable value in any later action.

A copy of Pamphlet No. 49, setting out further details, may be obtained on application to the Standards Branch, Department of Agriculture and Stock, Brisbane.

Brucellosis-Tested Swine Herds.

A herd listed by the Department as "brucellosis tested" is one in which all such animals as may be determined by the Director of the Department's Division of Animal Industry have been subjected to two successive tests for brucellosis, at intervals determined by him without any positive reactors being found A semi-annual or annual re-test of the herd, as determined by the Director, is required.

TESTED HERDS (As at 30th November, 1954).

Berkshire.

S. Cochrane, "Stanroy" Stud, Felton
G. Handley, "Handleigh" Stud, Murphy's Creek
J. L. Handley, "Meadow Vale" Stud, Lockyer
O'Brien and Hickey, "Kildurham" Stud, Jandowae East
E. Pukallus, "Plainby" Stud, Crow's Nest
G. C. Traves, "Wynwood" Stud, Oakey
E. Tumbridge, "Bidwell" Stud, Oakey
Westbrook Farm Home for Boys, Westbrook
M. K. Collins, "Kennington Stud, Underwood Road, Eight Mile Plains
H.M State Farm, "Palen" Stud, Palen Creek
A. R. Ludwig and Sons, "Cryna" Stud, Beaudesert
H. H. Sellars, "Tabooba" Stud, Beaudesert
D. T. Law. "Rossvill" Stud, Trouts road, Aspley
R. H. Crawley, "Rockthorpe" Stud, *via* Pittsworth
F. R. J. Cook, "Alstonvilla," Wolvi, *via* Gympie
Mrs. I. M. James, "Kenmore" Stud, Cambooya
H. L. Stark ." Florida," Kalbar
J. H. N. Stoodley, "Stoodville," Ormiston
H.M. State Farm, Numinbah
V. G. M. and A. G. Brown, "Bardell," Goovigen
R. E. Paulsen, "Crest" Stud, Binjour Plateau, M.S. 670, Gayndah
M. G. and R. H Atkins. "Diamond Valley" Stud, Mooloolah
L. Puschmann, "Tayfeld" Stud, Taylor
Dr. B. J Butcher and A. J Parnwell, "Hartley Grange" Stud, 684 Logan road, Greenslopes
C. E. Edwards, "Spring Valley" Stud, Kingaroy
G. J. McLennan "Murcott" Stud, Willowvale
H. M. Wyatte. "Deepwater" Stud. Rocky Creek, Yarraman
C. F. W and B. A. Shellback, "Redvilla" Stud, Kingaroy
R. J. Webber. "Webberberry" Stud. 35 Caxton st., Petrie Terrace
J. C. Lees, "Bridge View" Stud, Yandina
F. Thomas "Rosevale" Stud. M.S. 373. Beaudesert
A. C. Fletcher. "Myola" Stud, Jimbour
Q.A.H.S. and College, Lawes
E. F. Smythe. "Grandmere" Stud, Manyung, Murgon
The Marsden Home for Boys. Kallangur
M. F. Callaghan, Lower Mount Walker, via Rosewood
J. B. Lotz, M.S. 794, Kalbar

Large White.

H. J. Franke and Sons, "Delvue" Stud, Cawdor
Garrawin Stud Farm Pty. Ltd., 657 Sandgate road, Clayfield
J. A. Heading, "Highfields," Murgon
K. B. Jones, "Cefn" Stud, Pilton
R. Postle, "Yarralla" Stud, Pittsworth
B. J. Jensen, "Bremerside" Stud, Rosevale *via* Rosewood
E. J. Bell, "Dorne" Stud, Chinchilla
L. C. Lobegeiger, "Bremer Valley" Stud, Moorang, *via* Rosewood
H. R. Gibson, "Thistleton" Stud. Maleny
H.M. State Farm, Numinbah
K. A. Hancock, "Laurestonvale" Stud. Murgon
V. P. McGoldrick, "Fairymeadow" Stud. Cooroy
S. T. Fowler, "Kenstan" Stud, Pittsworth
M. D. Power, "Ballinasloe" Stud, Swan Creek, via Warwick
H. L. Larsen, "Oakway," Kingaroy
Mrs. I. G. Utting, "White Lodge," Mountain road, Cooroy
N E. Meyers, Halpine Plantation, Kallangur
Dr. B. J. Butcher and A. J. Parnwell, 684 Logan road, Greenslopes
G. I. Skyring, "Bellwood" Stud, *via* Pomona
O J Horton, "Manneum Brae" Stud, Manneum Kingaroy
Miss G. R. Charity, Coondoo, Kin Kin.
W. J. Blakeney, "Talgai" Stud, Clifton
F K. Wright, Narangba, N. C. Line
O B Vidler Manneum, Kingaroy
K. F. Stumer, French's Creek, Boonah
Q.A.H.S. and College, Lawes
R. S. Powell, "Kybong" Stud, Kybong, *via* Gympie
F. G. Rigby "Ingleborough," Kobble, Dayboro' Line.
S and S Ouglitchinin, "Pinefields," Old Gympie road, Kallangur.

Tamworth.

S. Kanowski, "Miecho" Stud, Pinelands
N. R. Potter, "Actonvale" Stud, Wellcamp
D. F. L. Skerman, "Waverley" Stud, Kainkillenbun
A. C. Fletcher, "Myola" Stud, Jimbour
Salvation Army Home for Boys, "Canaan" Stud Riverview
A. J. Surman, "Namrus" Stud, Noble road Goodna
Department of Agriculture and Stock, Regional Experiment Station, Kairi
E. C. Phillips, "Sunny View," M.S. 90, Kingaroy
F. N. Hales, Kerry Road, Beaudesert
T. A. Stephen, "Withcott," Helidon
W. F. Kajewski, "Glenroy" Stud, Glencoe
A. Herbst, "Hillbanside" Stud, Bahr Scrub *via* Beenleigh
H.M. State Farm, Numinbah
D. B. Alexander, "Debreczen" Stud, Kinleymore *via* Murgon
Dr. B. J. Butcher and A. J. Parnwell, 684 Logan road, Greenslopes
G H. Sattler, Landsborough
F. Thomas, "Rosevale" Stud, M.S. 373, Beaudesert
P. V. Campbell, "Lawn Hill" Stud, Lamington
H. J. Armstrong, Alhambra," Crownthorpe, Murgon
Q.A.H.S. and College, Lawes

Wessex Saddleback.

W. S. Douglas, "Greylight" Stud, Goombungee
D. Kay and P. Hunting, "Kazan" Stud, Goodna
J. Gleeson, "Iona Vale" Stud, Kuraby
C. R. Smith, "Belton Park" Stud, Nara
H. H. Sellars, "Tabooba" Stud, Beaudesert
H. Thomas, "Eurara" Stud, Beaudesert
D. T. Law, "Rossvill" Stud, Trout road, Aspley
J. B. Dunlop, "Kurrawyn" Stud, Acacia road. Kuraby
A. Curd, "Kilrock" Stud, Box 35, Jandowae
F. K. Wright, Narangba, N. C. Line
W. R. Dean. "Trelawn," Tandur, via Gympie
M. Nielsen, "Cressbrook" Stud, Goomburra
G. J. Cooper, "Cedar Glen" Stud, Yarraman
J. E. Heath. "Springlea" Stud, Murgon
Mrs. R A. Melville, "Wattledale Stud." Beenleigh road Sunnybank
A. J. Stewart "Springbrook," Pie Creek Rd., Gympie
S. and S Ouglitchinin, "Pinefields," Old Gympie road, Kallangur.

British Large Black.

H. W. Naumann, "Parkdale "Stud, Kalbar

Castrating Pigs.

By F. BOSTOCK, Officer in Charge, Pig Branch.

The castration of the male pig is a necessary and most important operation which must be attended to both by stud breeders and by farmers breeding for commercial purposes.

Castration is essential, not only because it enables the farmer to control the breeding operations at his piggery without hindrance, but because of the advantages to be gained in so far as pork and bacon are concerned, resulting in the production of a carcass free from sexual odours and flavours in the meat, while the flesh is much improved in grain and quality.

Although no statistics are available to indicate the percentage of pig carcases passing through these establishments suffering as a result of improper castration and the effect of neglect following customary methods of performing this operation, it is certain the percentage is higher than it should be, or than the industry can afford.

Much can be done to minimise losses and ensure successful work by following the details as outlined herein, and if one item should be stressed more than another it is cleanliness in all operations. There is no reason why ill

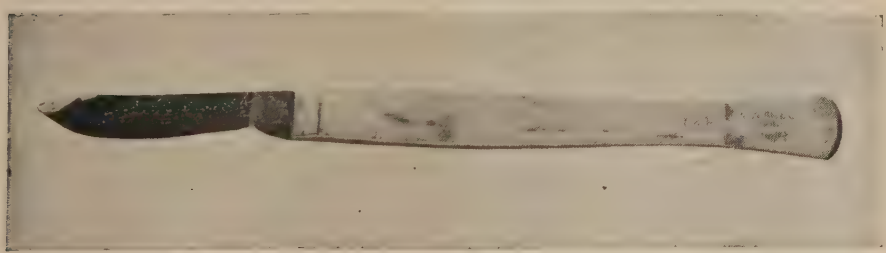


Plate 1.

Knife Suitable for Castrating Pigs.

Unfortunately, many owners feel that the correct methods of castration are too much bother and that "bush" methods are the most practical for general use, but one has only to visit the bacon factory or meatworks to realise the number of pigs which have been improperly castrated and which suffer partial condemnation as a result of abscess formation, &c.

effects should follow such a simple operation if it is carefully performed, nor should there be any check in growth or development of the animal if the operation is carried out at the correct age before weaning.

Some overseas authorities refer to the term "castration" as applying to the removal of the testicles from the male, and also the ovaries from the

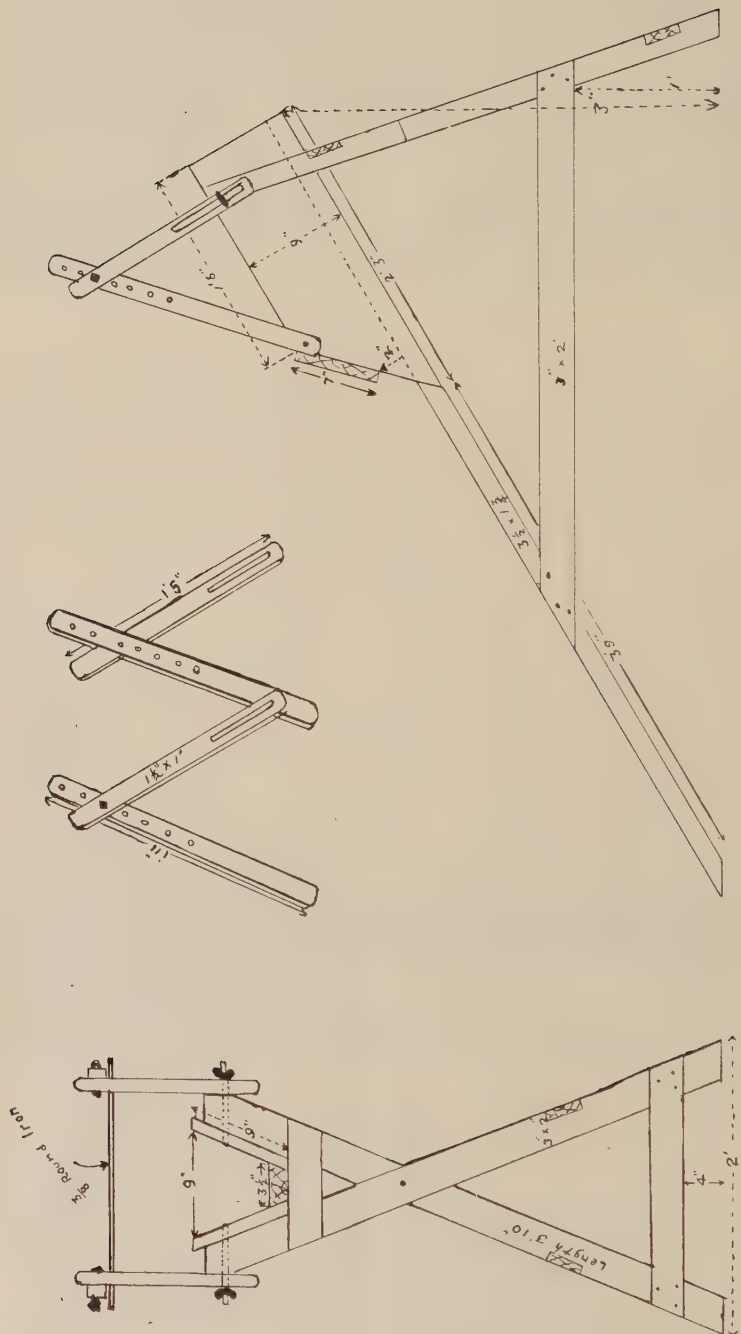

3 x 2
3 x 2
3 x 2
3 x 2
19"
1½ x 1½
11"
6'
6'
3'
2'
4'
3 x 2
Length 3'10"
6'
3'
6'
3'
6'
3'

Plate 3.

Two Views of the Castration Crate of Plate 2.

female, but in Australia the term "spaying" is universally used in referring to the operation of surgical removal of the ovaries of the female.

The pig farmer need not, however, be concerned with spaying, for it is an unnecessary operation and is not recommended. It is unnecessary by reason of the fact that, under normal conditions of management, the sow pig under six to seven months of age will not be affected sufficiently in growth and development by her usual three-weekly periods of oestrum to warrant the operation, and not recommended because it is a risky and complicated operation which in general should only be performed by an experienced veterinarian.

In the case of male pigs a strong sexual odour is noticeable when a boar pig has been slaughtered, and this odour develops into a most unpleasant flavour in the meat, particularly during its preparation for the table. Fortunately, these sexual odours and flavours disappear in the case of young pigs castrated two or three months before slaughter, but they are always more or less noticeable in the carcases of males that have been castrated late in life, especially of boars that have been in active breeding for several years prior to castration.

These latter (stags) are a most undesirable class of pig from the standpoint of the manufacturer, and Departmental advice is to castrate all boar pigs not required for breeding purposes before they are weaned. Run no risk, and utilise the feed to advantage rather than to disadvantage by feeding "old staggy sorts." It is certain that when castration is performed on an animal over three months old

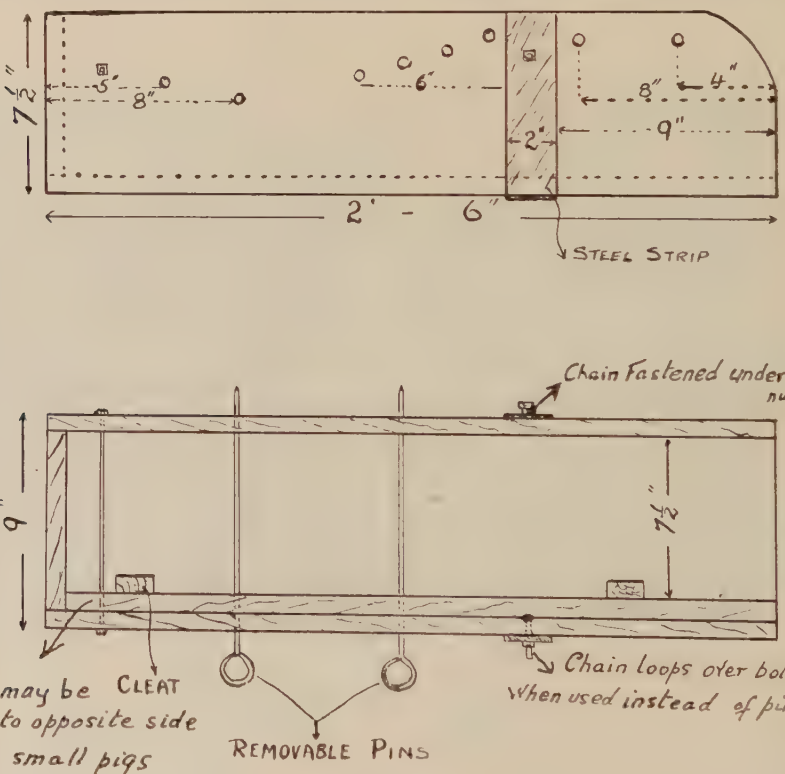


Plate 4.

Diagram of an Alternative Castration Crate.

Plate 5.

Two Views of the Castration Crate of Plate 4.

it will take much longer to recover, and the loss of condition and subsequent loss of time in fattening are items worthy of careful consideration.

It is interesting to note that before birth, and sometimes for a short time after, the testicles of the pig may be contained within the abdominal cavity. Under normal conditions they pass through comparatively narrow openings at the base of the abdominal cavity and continue through a small canal known as the inguinal canal to the scrotum or purse, pushing ahead of them folds of the lining membrane of the abdominal cavity, known as the peritoneum, which cover or envelope the testicles.

It is well known to all pig breeders that instances occur in which the testicles are not normal. There may be only one testicle showing (either the right or the left side), and in this case it is apparent that only one has descended into the scrotal sac. This is due to some unknown cause and is difficult to understand or describe. Pigs with only one testicle showing are known as "rigs." Their castration is unsatisfactory, for there is the fear that the other testicle will descend into the scrotum later and render a second operation necessary, or, if it does not descend, the animal may become a nuisance as it may mature sexually or at least partly so.

When to Castrate.

Pigs may be castrated when four to six weeks of age and while they are still suckling the dam, as at that age there is considerably less shock to the nervous system and the growth of the pig will not be checked. A four to six weeks' old pig can be handled conveniently, and the testicles are large enough to render their removal quite simple. The older the pig is the greater the shock and risk and the more severe the after-effects. However, careful observations have indicated that there is no significant difference in the growth rate up to weaning age of a male pig castrated at birth and one castrated at five to six weeks of age.

Treatment of Animal, &c., Prior to Operation.

No animal should be castrated without being properly prepared; hence the following rules should be strictly observed in order to avoid unnecessary trouble and loss:—

(1) The animal should be kept without food for at least six hours before the operation is to be performed. Clean drinking water, however, should be available.

(2) The knife (Plate 1) should be sharpened to razor-edge. Prior to the commencement of the operation and while not in use the knife should be kept in the disinfectant solution.

(3) Select a dry, cool day. Castration should not be done during very cold, windy or rainy weather.

(4) Use a 2-3 per cent. solution of a reliable disinfectant (lysol, sheep-dip, Dettol, &c.).

Antiseptic Oils.

Suitable antiseptic oils for use after castration may be made from the following recipes:—

(1) Mix 1 part of carbolic acid with 10 parts of olive oil.

(2) Dissolve 1 ounce of iodoform in 14 ounces of eucalyptus oil, and when quite clear, add 30 ounces of olive oil.

These oils are in every way preferable to kerosene or other "bush remedies," not only from a humane point of view but because they stimulate the healing processes and repel flies.

The Operation Described.

The operation is best performed by two persons, although good results are secured by the use of a one-man castration crate (Plates 2-5).

The first testicle having been removed, the second one is also taken out in a similar manner, but through a second incision made for that particular purpose.

After-treatment and Care.

After the operation is completed (Plate 14), antiseptic oil should be poured into the wounds and the animal placed down, front feet first, to avoid contamination of the wound with dirt, into a clean dry pen or well-covered grass yard.

Complications following proper castration are rare, but when the work is not properly done, the parts not washed, or where the knife is not kept clean, abscess formation (Plate 15) is common. If this occurs, the abscess should be opened at its lowest point with a clean and properly disinfected knife, and the wound syringed out with a warm disinfectant solution, taking care not to use too much pressure. When found necessary, wash the wound twice daily until properly healed, using liberal applications of antiseptic oil each time.

Castration of a Ruptured Animal.

The castration of a ruptured pig is a much more difficult operation than that of a normal animal, and must be performed by the "covered" method. This consists of cutting through the skin of the scrotum alone, the testicle and its covering envelope being taken out in one mass and drawn out as far as possible without undue strain; the cords at the base of the testicles are then tied with silk thread or surgical gut. The testicle is then removed by the aid of the emasculator

Plate 7.

Washing the Scrotum and Surrounding Parts Prior to the Operation.

Everything should be in readiness before catching the pig, which should be held firmly on its back (Plate 6) to prevent struggling, which makes it difficult for the operator to work. In whatever position the pig is held it must be held firmly, and so that the testicles may be handled freely.

The incision should be deep enough to enter the fleshy part of the testicle, thus liberating it from the envelope in which it is normally situated, and long enough to free the testicle without undue pressure and to allow for drainage. Care should be taken to see that the cuts are not made too close, across the middle line of the body or off the surface of the scrotal sac, as this may result in excessive bleeding and soreness.

Plate 6.

A Method of Holding a Young Boar.

The next move is to wash the scrotum or purse and surrounding parts thoroughly with the disinfectant solution (Plate 7).

When all is ready the operator seizes one of the testicles between the thumb and forefinger of the left hand, keeping the remaining three fingers closed (Plate 8). An incision is made through the scrotal sac (Plate 9) parallel with the middle line of the body and about half-an-inch to the side of this line, keeping the cuts low, or in such a position that when the animal stands up the blood, &c., will drain away and not collect in the scrotum, as would be the case where the cuts are made high.

The testicle is now drawn out and the thin tissue immediately under the testicle cut through together with the spermatic cord (Plate 10), after which the testicle while being drawn away is scraped (not cut) free from its remaining attachments (Plate 11). The blood vessels should never be cut off abruptly except when the emasculator is used (Plates 12 and 13), as to do so may cause severe haemorrhage. Jerking out the testicle is also dangerous, as it may result in rupture.

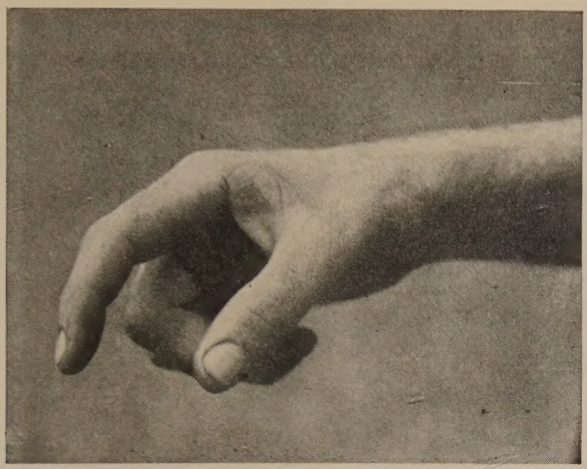


Plate 8.

Showing the Position of Thumb and Fingers when Holding the Testicle before Removal.

After the second testicle has been removed in a similar manner, three or four stitches should be inserted in the scrotum so as to prevent risk of further rupture.

In the case of young pigs that are ruptured it would pay better to slaughter the animals and use as fresh pork. A veterinary surgeon should certainly perform the operation on a mature boar ruptured late in life.

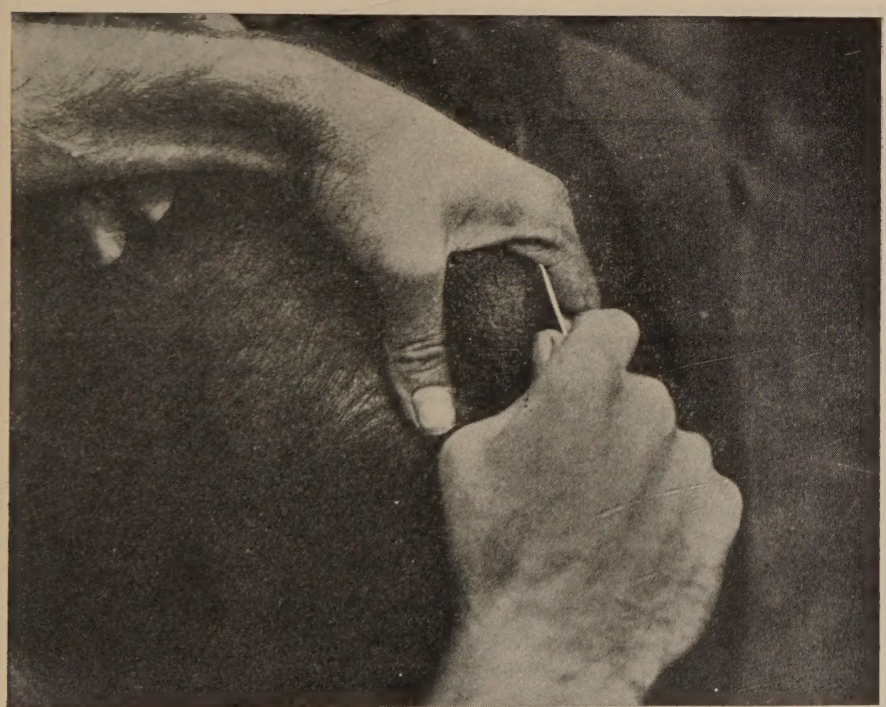


Plate 9.

Showing Testicle Firmly Held in the Sac and the Knife in Position Ready to Make the Incision.

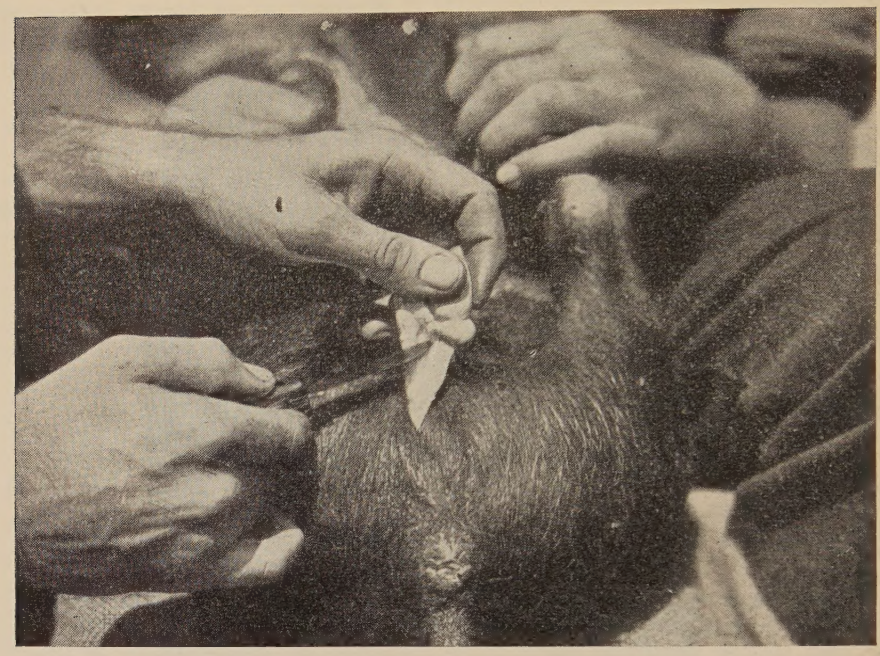


Plate 10.

Cutting Through the Thin Tissue Before Scraping the Testicle Free.

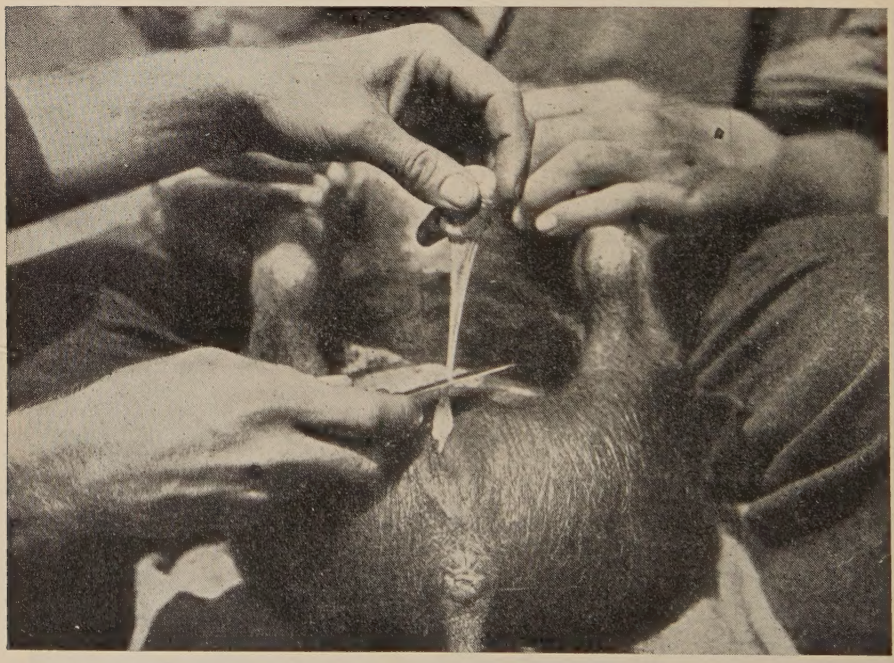


Plate 11.

Showing the Testicle Drawn Out and the Cord Being Scraped.

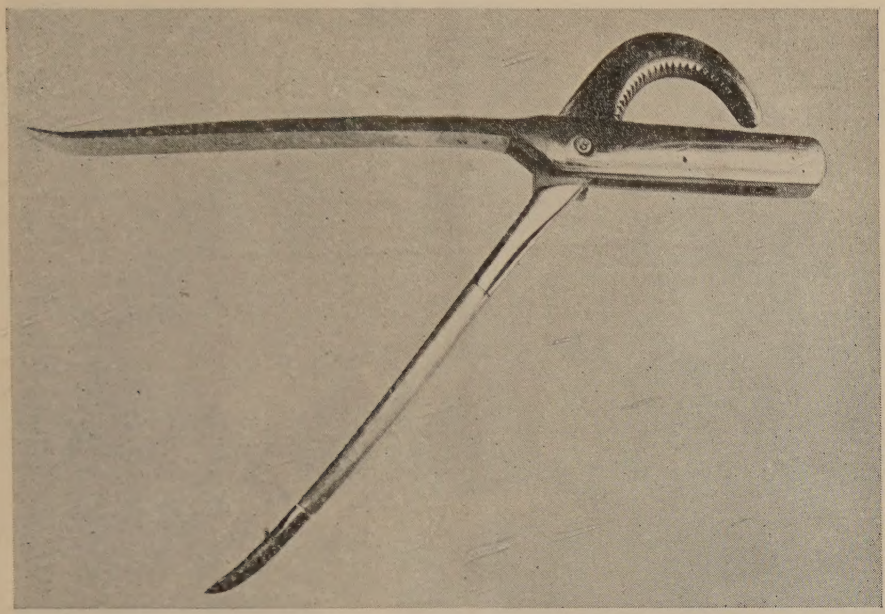


Plate 12.

An Emasculator for Use on Aged Boars.

Plate 13.

Using the Emasculator as in the Case of a Well-grown Boar.

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1. P.C.

Plate 14.
Showing the Operation Completed.

Plate 15.
Abscessed Areas Resulting from Incorrect Castration.